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The EXPERIENCE *and* EQUIPMENT *to handle any assignment*

Methods developed by Mahon have set a new standard in the production of welded steel plate products in all sizes, shapes and weights. These methods call for a vast amount of specialized modern equipment. Without it the enormous production that goes through our plant each day would be utterly impossible.

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Our DESIGN ENGINEERING SERVICE is proving particularly helpful to manufacturers like yourself. First: in determining whether your product is adaptable to steel plate fabrication. Second: in assisting you to redesign it so that it may be produced practically and economically.

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The IRON AGE

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Great Expectations

IT'S nice to have great expectations if you have a definite program to fulfill them. If not then it's better to learn and earn than to sit back and yearn. That's what too many of us are doing today.

It is being dinned into our ears daily that because of this war we are going to emerge into a new and better world where everyone can press buttons, metaphorically speaking, and in some mysterious automatic way receive filet mignon, colored television sets, laborless dishwashers and other attributes of a higher standard of living.

Fairy stories have been written on that theme. The story of Alladin's Lamp was one of them. But at least Alladin had to use some elbow grease before the genie appeared to do his bidding.

Perhaps this rosy aura of hopefulness and wishful thinking is helped along in an election year by the political promisers who have advanced from the stage of kissing babies for votes to that of promising mythical Rolls-Royces to hopeful housewives. Plus plenty of gas with which to run them. (The Rolls-Royces, not the housewives.)

All of this reminds me of a story. Once upon a time a young farmer who had labored hard and successfully for a number of years to build a home and barns had the misfortune to have his house and barns burn down. A sympathetic neighbor came to him and said: "Friend, just think of the much better buildings you will have when you get your insurance." But the farmer replied: "I haven't any insurance. But I am going to have those better buildings nevertheless." And his friend, wondering, asked him where he was going to get them from.

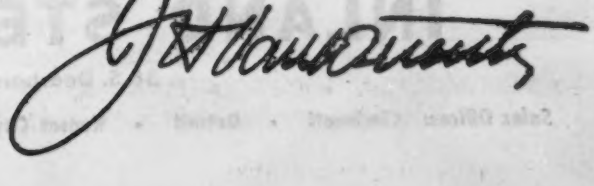
"I am going to get them from the same source that they came from originally," said he. "And what is that?" queried his neighbor. "From a hell of a lot of hard work, which is where everything comes from," said the farmer.

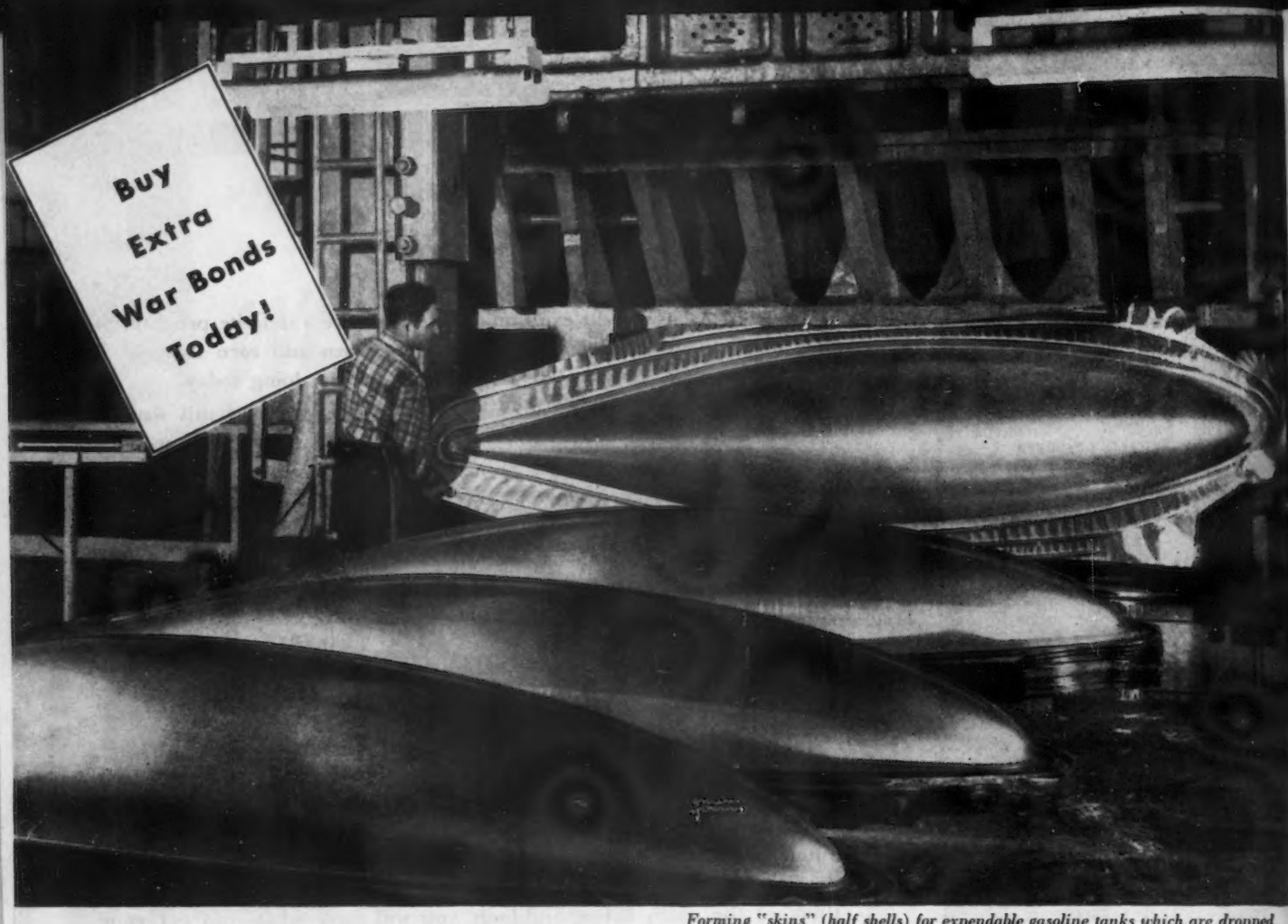
The world has been conducting the biggest bonfire that ever was. Probably a trillion dollars—a thousand billion in other words—would not begin to measure the destruction of material values that have taken place in all countries of the world during the past five years. Are you going to emerge from that into a better standard of living for everybody without, as the farmer said, "a hell of a lot of hard work"? I don't think so.

If that were the way to raise the scale of prosperity, we should hold annual bonfires in all of our communities and burn up most of our possessions.

Frankly, don't you agree with me that this thought is about as silly as the idea that a country can become prosperous by increasing its debt year after year without remission?

Creation, not destruction, makes wealth. The sooner we get that into the heads of everyone the better it will be for us and for the rest of the world. And hard work is the basis of the creation of values. It's a sounder basis than WPA's or lend-lease.





Forming "skins" (half shells) for expendable gasoline tanks which are dropped from fighter planes when empty. Sometimes they are used as incendiary bombs.

Expendable Gas Tank "Skins" Made of Inland Steel

Today, thousands of fighter planes are being flown direct from our airplane factories to distant battle areas, hundreds of them are giving fighter protection to our bombers on long range bombing raids. Helping to keep these fighters in the air longer, are expendable gasoline tanks made from Inland Cold Rolled Sheets.

Thousands of tons of 0.024″ gage, 48″ x 144″ cold rolled sheets already have been shipped by Inland to Mills Industries, Inc., Chicago, where these tanks are formed on a 750-ton, triple-acting press. Each 165-gal. tank consists of two identical half sections or "skins." A sheet is fed into the press, where it is first gripped by the formation of two corrugations extending along each side. The draw is 14″ at the deepest point. After the skins are formed they are trimmed and then sent to the assembly line where internal structural bulkheads are installed. After air and gas lines have been put in place, the half sections are chemically treated to prevent rusting, dried, aligned and seam welded. Each tank is then pressure tested, perfectly balanced, and finally painted inside and out.

Continuous production of these expendable gasoline tanks tells the story again of Inland service and of the fine drawing qualities of Inland Cold Rolled Sheets.

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The IRON AGE
September 12, 1944

NEWS FRONT

► Output of tin mill products this year will reach 3,000,000 tons, against an 8-yr. average of 2,500,000 tons yearly. All-time peak was 4,000,000 tons in 1941.

►Users of tin are looking for some form of tin allocation for about 2 yr. after the Pacific war ends. Plans are being laid to tow dredges to Australia so they will be near at hand when the Japs get kicked out of the Far-Eastern tin fields.

► Although WPB allocated 7,000,000 lb. of aluminum to the can companies for the third quarter for general-line can production, customers so far have shown no great interest, because of the higher price and because they have contracted for other types of containers. Practically none of the aluminum will be used in this quarter.

► In about a month the Government suit against all stainless steel producers should be in full swing in Trenton and Newark, N. J. The companies have been given a going-over during the past year in an attempt to flush undesirable pricing and patent practices.

The stainless companies are somewhat in the dark about the whole thing, but are cynically conscious of the precise pre-election timing of the court hearings.

► H. G. Batcheller was literally shanghaied back to the WPB. Faced with a lot of postwar problems of his own at the Allegheny-Ludlum Steel Corp. he twice turned down suggestions to return, only to be faced with a newspaper story that he had been named operations vice-chairman.

► Sears-Roebuck intends to put up 50-lb. packages of welding rods for sale to farmers, in assorted sizes and for different purposes. Another package of 5 lb. to 10 lb. of assorted sizes will be sold to garages and the like. These welding rod packages will supplement the five models of welding equipment currently directed to farms, garages and small industry.

► Glasgow Corp. has announced intention of using foamed slag blocks from nearby blast furnaces for the construction of postwar houses in the Glasgow area.

► The English have built and are experimentally flying a "slip-wing" airplane. The craft is a conventional low-wing monoplane, to which a second wing may be attached to form a biplane. After getting a heavy load into the air, the upper auxiliary wing is jettisoned.

► The extensive cutbacks contemplated to follow the defeat of Germany will make possible for industry to produce civilian goods equal to the volume output of 1939, according to WPB's new acting chairman, J. A. Krug.

To reach the 1939 level, civilian production would have to rise 30 per cent in a year.

Cutbacks are expected to fall as follows: Army Ground Forces, 50 per cent; Army aircraft, 20 per cent; Navy, 20 per cent, and the Maritime Commission, 50 per cent in a year's time. Navy and Maritime reductions are expected to be tapered.

► Transfer of automotive technicians to civilian jobs will be formalized at the Sept. 14 meeting of the Automotive Industry Advisory Committee and the WMC in Detroit. All companies will be authorized to transfer engineers and other specialists to peace-time production preparations. The preparatory stage will be fairly well developed by the end of the month.

Two major problems confronting the auto industry are the arrangements for clearing plants of government equipment and the machine tool situation.

► A recent debate in the British Parliament touched off by the question of why British and Scottish steel workers are being laid off while imports of steel ingots and semi-finished steel from the United States are on the increase brought to light the tremendous task of British inland transportation in moving men and materiel to the Allied armies in Europe.

With all its transportation so occupied, British steel mills have had to reduce output since they had no means of shipping to fabricators.

► Helicopters are now in service in Burma with the American Third Tactical Air Force. The pilots, all volunteers, were trained at the Sikorsky factory.

Designing Rubber Press Tools

BY J. ALBIN

. . . Accurate forming of sheet metal in the hydropress can be accomplished if consideration is given to the dual action of the frictional and fluid properties of the rubber when under compression. Based on this analysis of rubber pad action, design standards have been established together with the development of unusual form blocks and other rubber press tools. Elimination of hand finishing is illustrated by novel uses of dams, undercuts, punches and other tool elements. In the second and concluding part of the article, these tools are applied to form flanges, joggles and some new difficult shapes. The data are from Eastern Aircraft Division, General Motors Corp., Linden, N. J.

THE present task of the rubber press tool designer results from the necessity for more accurate methods of producing sheet metal aircraft parts imposed by the trend of the war. This trend is toward greater size and diversity of the planes built and greater economy and refinement of design. In consequence of such development familiar tooling problems for which approximate solutions were formerly considered adequate are now frequently found to require more precise treatment, and at the same time a greater speed in producing new tools is imposed.

In order to keep pace with the rapid development progrem, a research program in hydropress techniques was started last year at Eastern Aircraft, more specifically, to test existing tool designs and establish standards of design and their limits of application and also to develop new designs. This article contains all the information utilized from previous sources as well as the results of the research program at the present time.

The general physical arrangement of hydropress equipment is shown in Fig. 1. A plate on the press bolster supports the form block. The metal to be formed is placed on the form block and held in place by locating pins or thin nesting blocks. Fastened to the press ram is a cast steel alloy case into which the rubber blanket is fitted, see Fig. 2. As the press closes, the platen fits into the mouth of the case and forms a closed chamber containing the part to be formed, the form block and the rubber. On applying this high pressure the rubber forces the sheet metal against the form block.

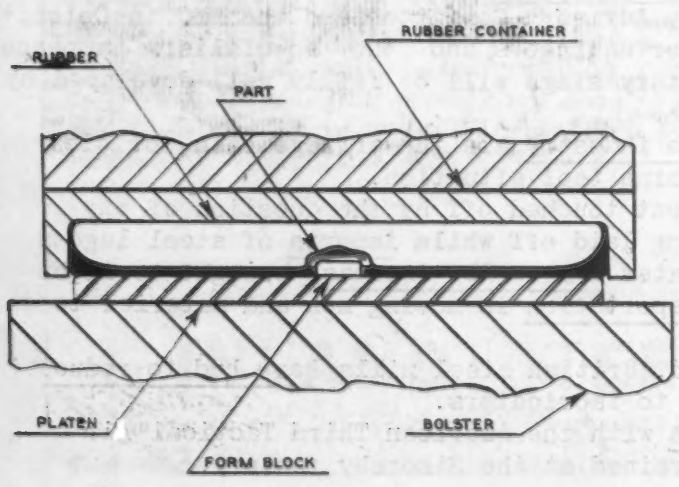

FIG. 1—Elements of process of forming sheet metal in the hydropress.

Most of this primary forming is accomplished by the mechanical strength of the rubber resisting deformation. The finished flange results from side pressure caused by the fluid flow of the rubber under high compression and close confinement. As indicated by tests, described subsequently, the compressed rubber does not act completely as a fluid but the force it exerts is a combination of mechanical and fluid properties.

The press shown in Fig. 3 is a 2500-ton press used for rubber forming many of the parts illustrated in this article. Four moving tables make continuous operation possible. Loading is done outside the press so it will not stand idle while changing parts. The press can operate at 3 strokes per min. and form an average of six parts per stroke producing over 1000 parts per hr. The size of the platen is 36 x 76 in. and the pressure obtained in the press is 1827 lb. per sq. in. This figure is obtained by dividing the tonnage by the area of the platen in square inches.

$$\frac{2500 \text{ tons} \times 2000 \text{ lb.}}{36 \text{ in.} \times 76 \text{ in.}} = 1827 \text{ lb. per sq. in.}$$

Three 2-in. layers of rubber cemented together form the pad. Generally a 6-in. thick pad limits the designed height of form blocks to 3 in. high. However, there are some instances where blocks up to 4 in. high may be used. When blocks over 3 in. are used, the life of the rubber pad is greatly reduced. A form block height of 2 to 3 in. is best suited for a 6-in. thick pad.

Straight flanged parts are the type of work that can be done in the hydro-

LEFT

FIG. 2—Rubber pad in case shown over formed parts. Note the perforations and cuts in the surface of the rubber caused by the work.

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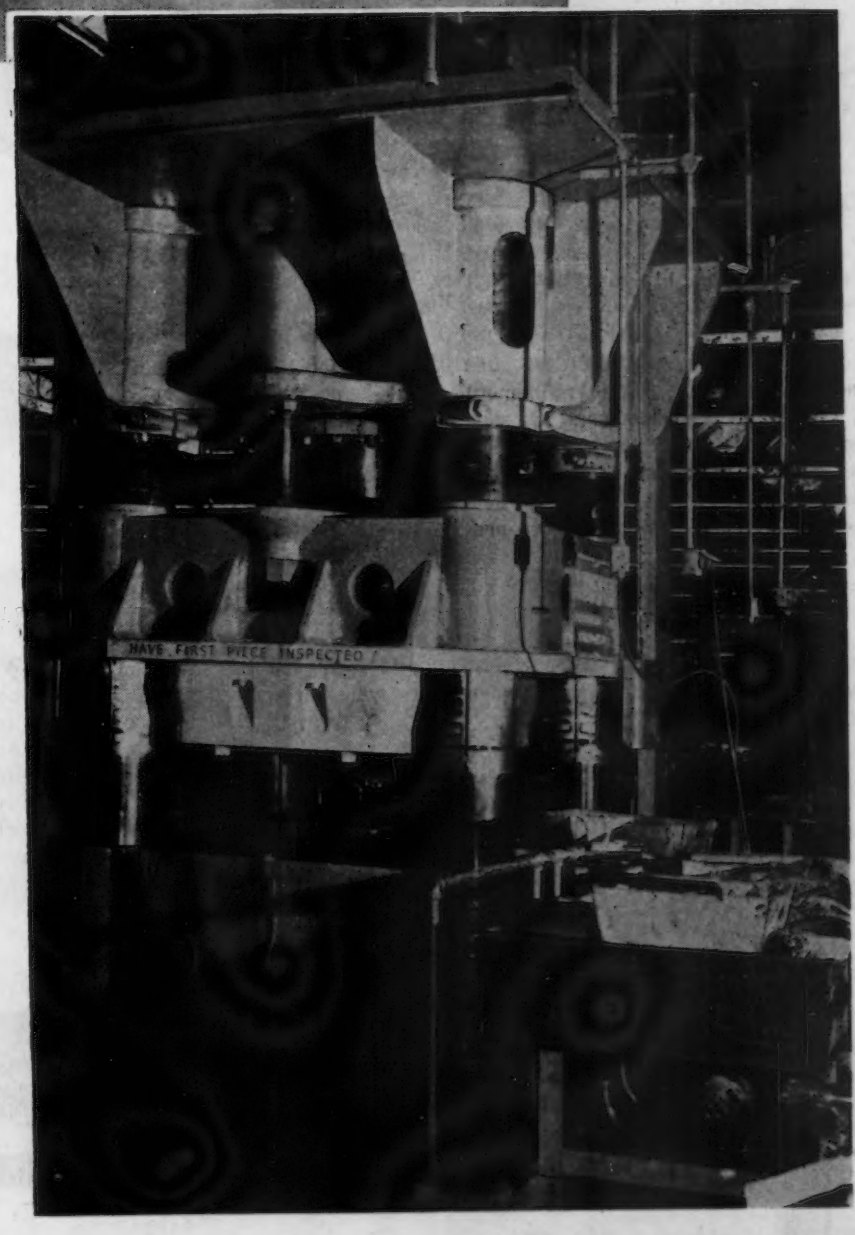
BELOW

FIG. 3—A 2500-ton hydropress. Work is loaded on tables outside of press.



press without the use of special form block construction to guide the compressive force of the rubber about the flanges. Straight flanges can be accurately formed without any subsequent hand-finishing.

When metal in certain sections of a part must be stretched or increased in area, a drawing operation is being approached. Fig. 4 shows parts containing curved flanges which involve stretching of the metal. These parts can be formed by rubber action but the operation is more limited and requires a close study of the form block construction. Very high pressures approaching the limits of the 2500-ton press are required for this type of forming. Sharp corners, generally speaking, cannot be formed by rubber action alone.

Parts having a shape that rubber will flow into without severe distortion can be formed with rubber acting as the punch. They will be generally shallow, have well rounded corners end edges, but may be reasonably sharp on the draw ring radius. The parts shown in Fig. 5 have been drawn and formed with rubber. Parts having sharp corners where high local pressure concentrations are required must be made with a solid punch and a pressure pad.

Aluminum Sheet Tempers

Rubber as a forming medium is generally applied to aluminum alloy sheet metal parts. Before considering the action of the rubber, it is nec-

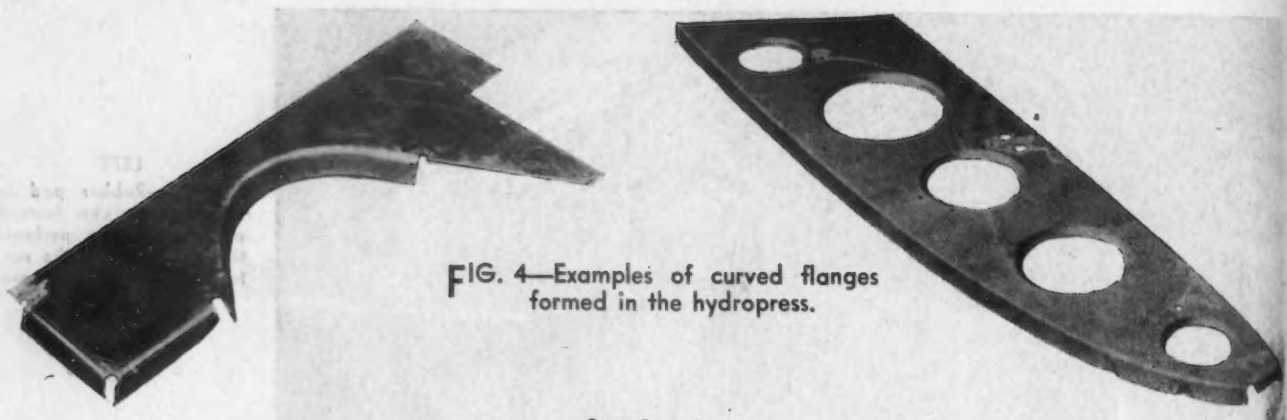


FIG. 4—Examples of curved flanges formed in the hydropress.

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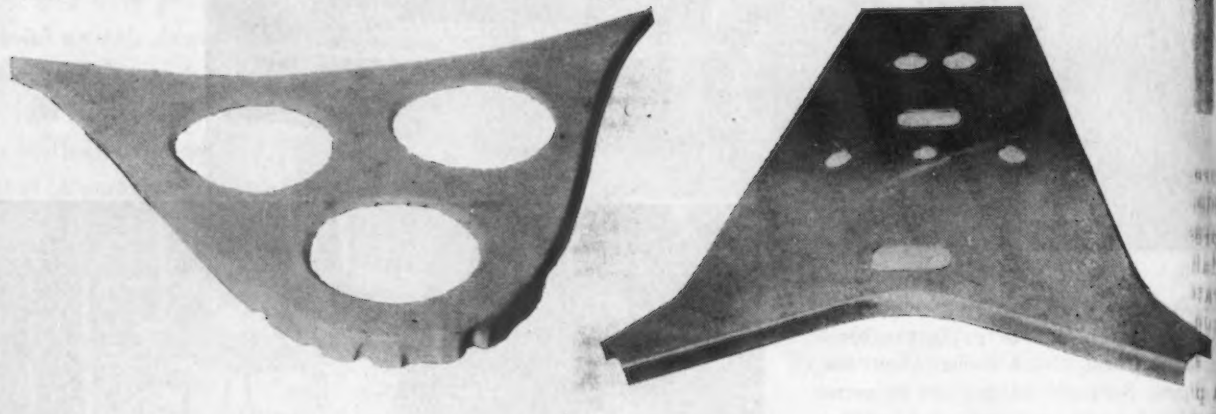

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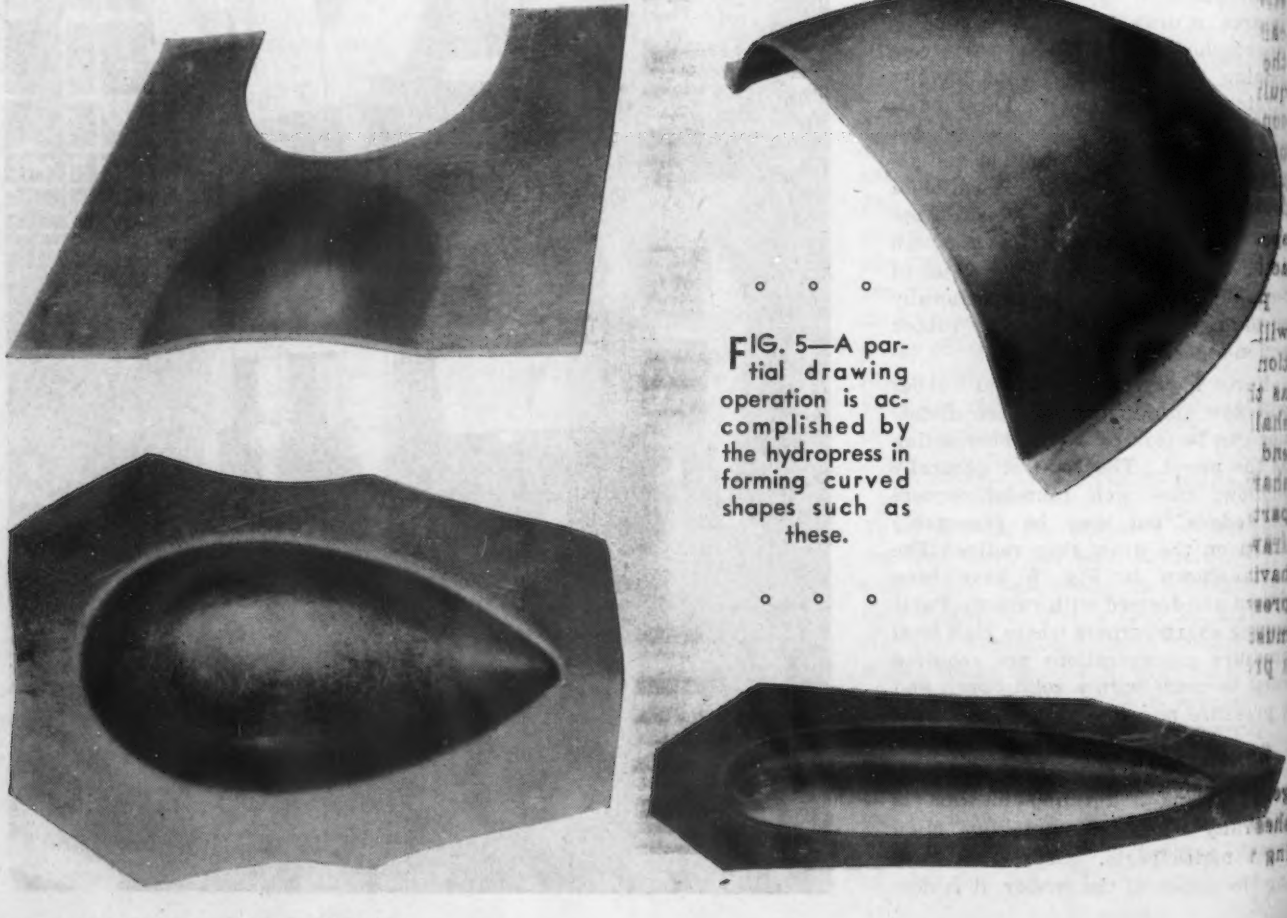

FIG. 5—A partial drawing operation is accomplished by the hydropress in forming curved shapes such as these.

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essary to understand the three physical conditions in which aluminum is formed.

Briefly the S types of aluminum may be worked in one of the three tempers, namely, SO, ST and SW.

Aluminum alloy specified as 24 SO indicates that the metal is in the soft or annealed condition. This means it can be formed most readily by rubber. Straight flanges on parts of 0.125-in. thickness are readily formed in SO. Drawn operations likewise can be produced in thickness up to 0.064 in. Subsequent heat treatment to obtain the ST condition warps the parts which in turn requires hand straightening operations, thus the original accuracy of the part is lost.

The aluminum alloy in the ST condition, meaning that it is physically hard or tempered, is not so easily formed by rubber. However, successful straight flanges can be produced in this condition on stock gages up to 0.051 in. The aluminum alloy in this condition is not suited to drawing operations. Forming, when possible, in the ST condition requires the least number of operations.

Aluminum alloy in the SW condition indicates that either the SO or the ST sheet has been solution heat treated and remains in the soft state for a short period of time. This period of softness is lengthened by keeping the material refrigerated at temperatures well below the zero point. While in the soft SW condition, forming operations must be completed. After forming, the material hardens at room temperature and becomes ST. When severe distortion is likely to take place by heat treating SO material after forming, it is advisable to form in the SW condition, allowing the part to age-harden after it has been formed. Where this procedure is followed no hand straightening of the part is necessary. It must also be understood that forming in the SW condition requires an extensive amount of refrigeration equipment and a close watch on material handling in order to keep the parts soft and uniform in temper before forming. For this reason, most of the forming described here has been done with SO stock.

A knowledge of the composition of rubber will help toward understanding how it acts. All grades are composed of crude rubber, sulphur, plasticizer, anti-oxidants and fillers. Crude rubber is coagulated from latex, the juice of a rubber tree grown on plantations and is the basic material of all natural rubber compounds. Other materials are added by kneading between two powerful rollers giving the rubber desirable physical properties. When sulphur and heat are added it becomes vulcanized. If heated in this state, it will scorch or burn, but it will not get soft. If unvulcanized rubber is heated, it becomes soft, or thermoplastic.

FIG. 6—A Shore durometer for measuring rubber hardness.

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Unvulcanized rubber is comparatively easy to compound and to process by forming or molding. Then, after it has been formed to the proper size and shape, it is vulcanized to the required degree of stiffness and mechanical stability.

Plasticizers are added to reduce the hardening with age, and anti-oxidants are added to prevent the surface of the rubber from cracking due to the action of the oxygen in the air. Fillers are not used to cheapen rubber but to give it mechanical properties not obtained in pure vulcanized gum rubber. Iron oxide, chalk, silica flour, carbon black and other pigments are used. Carbon black increases the hardness of rubber, gives good wear resistance, tear and cutting resistance with reasonable elongation. Rubber with this type of filler is used for rubber forming.

Hardness of rubber is fairly well standardized and is measured with a Shore durometer shown in Fig. 6. The scale shows how far a spring can force the penetrator into the rubber. Hardness is defined as the resistance to deformation. This resistance is part of the force used to form metal and will be greater for hard rubber.

Forming is usually done with 50 to 60 durometer rubber but harder grades can be used. Rubber blanking employs 70 durometer to develop high forces to shear the metal. It can be used for forming thick metal but breaks down quickly. Grades harder than 80 durometer cut and tear easily and have low elongation.

o o o

FIG. 7—Test to show that slippage of rubber is slight. Dots of paint on block are transferred intact to pad above.

Action of Rubber Pad

The shear factor of rubber is most important in studying the forming action of rubber. The ability of compressed rubber to form a sheet metal part depends upon the rubber's resistance to deformation up to the point where the rubber begins to shear. If the ultimate shear point is surpassed, the pressure concentrations drop very readily and the sheet metal is not formed correctly.

The frictional properties of rubber have a great effect on the manner in which it is distorted. Since rubber is commonly used dry there is little slipping. As the slipping of the rubber on the formed part increases, the mechanical ability of the rubber to form the part decreases.

Some past theories on the ac-

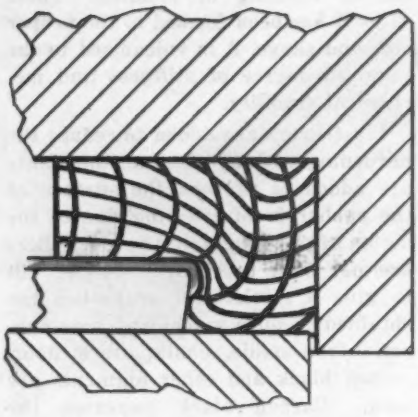


FIG. 8—Diagramming the internal flow of the rubber.

placing dots of paint on the form block at regular intervals. A rubber pad was then placed over the form block. When removed from the press, it was observed that the dots of paint were transferred closer together on the rubber pad.

As a rubber pad is forced down over a form block, its mass displaces rubber from the area over the top and across the edges of the block to the space at the side, see Fig. 8. This displacement is an internal flow of the rubber and not a surface action. Rubber is compressed above the block and forced sideways. This force, combined with compression of the rubber on the side, pulls the rubber around the edge of the block causing a high compression and pulling force.

Many articles on the subject of rubber press work present the idea that rubber will flow under a flange unless the space between the end of the flange and the platen of the press is kept below ⅛ in. Now tests show that more efficient form blocks can be designed by keeping this height above ¾ in. to increase stretching.

Form block height should be independent of flange width as much as possible, even for narrow flanges. The measurements should be from the platen of the press to the radius since all the work is accomplished at that point. A wide flange can be produced on a 1-in. block much easier than a narrow flange. If rubber does not flow under a narrow flange, it will cause no trouble on a wide one.

Flange Widths

In order to study flange widths, a method of measuring the results must be established. The common practice is to measure the width from the face of the material to the edge of the flange as shown in Fig. 9 at *a*. When a flange is formed in rubber the force which bends the radius is produced on the flat surface extending from the flat surface to the edge of the flange.

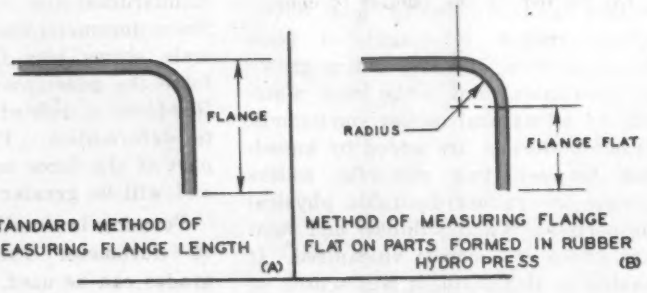


FIG. 9—Two methods of measuring flange widths.

tion of rubber in a rubber press have considered the rubber to act entirely as a fluid having very little mechanical strength and being able to flow into almost any opening.

Experiments have shown that the mechanical strength of the rubber and its frictional properties are just as important as the small amount of fluid flow which takes place. As the rubber pad approaches a form block, the rubber first touches the highest points and the friction holds the surface in this position even after the press is at maximum pressure. Rubber travels down the edge of a block in the form of a curve extending between the block and the platen of the press, stretching taking place on the free surface. A very slight amount of slip takes place on a vertical edge but none on the top of a block.

Tests were carried out to show accurately what happens inside the press. Small dots of chrome yellow oil pigment were placed on a form block which was placed under the press. When the block was removed it showed that the dots spread slightly and smeared on the radius of the block where the rubber slipped. This test has shown that very little slipping takes place, see Fig. 7.

Another experiment to determine the surface elongation was prepared by

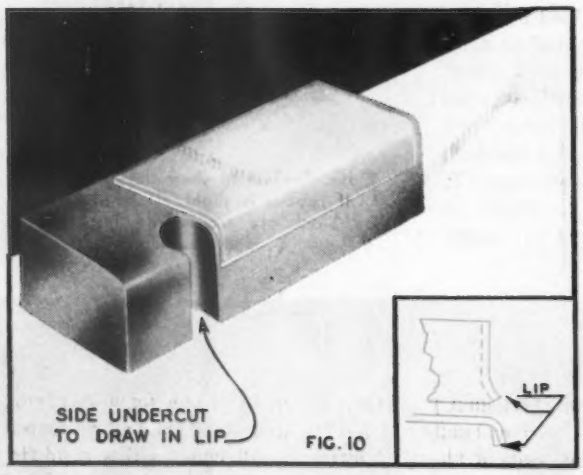


FIG. 10—The side undercut prevents lip caused by work hardening.

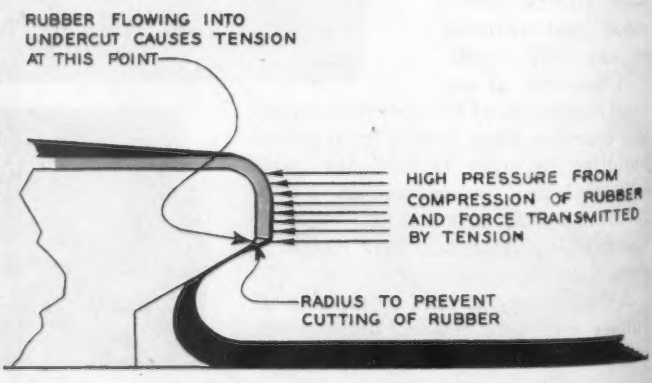

RUBBER FLOWING INTO UNDERCUT CAUSES TENSION AT THIS POINT
HIGH PRESSURE FROM COMPRESSION OF RUBBER AND FORCE TRANSMITTED BY TENSION
RADIUS TO PREVENT CUTTING OF RUBBER

FIG. 11—Type of undercut construction effective for narrow flanges.

The term *flange flat* will be used here to indicate this dimension, see Fig. 9 at *b*. For one set of conditions any flange width can be produced down to a certain size. Below this width of flange flat, a complete 90 deg. flange does not always form. This minimum width which will be called the critical flange flat width, is a measure of the ability of the rubber to form a flange flat. The narrower the flange flat, the more effective is the force of rubber. Even though a flange angle is not 90 deg. there will always be a flat at the edge.

Different bend radii may affect the critical width because the metal is stretched more on a small radius and will work harden more, thus increasing the critical width.

A common failure in forming flanges has been observed when extremely thick stock is formed over a sharp radius. The metal seems to form in a natural curve larger than the radius of the form block. This is due to work hardening of the metal on the radius as bending proceeds. Since the metal will bend more easily where it has not already been worked, the bending will progress toward the edge of the flange producing a curve which is not a true radius. When minimum bend radii are observed and thin beveled top plates are used, this effect is reduced but not eliminated. More distortion resulting from work hardening takes place on a sharp narrow radius than on a wide radius.

On certain short flanged parts a lip forms. This is sometimes caused by the failure of the rubber to complete the flange. But most often the cause of the lip is due to work hardening. Work hardening is caused by a shear fracturing the metal. This work hardening can be removed by burring the part. Oftentimes the work hardening is too far into the part and no amount of burring will remove this condition. A side undercut on a form block will allow rubber to flow into undercut causing a pressure concentration at that point and will draw in the lip (see Fig. 10).

The minimum bend radii to be observed for sheet metals, including steel and magnesium alloys in addition to aluminum alloys are carried in Table I.

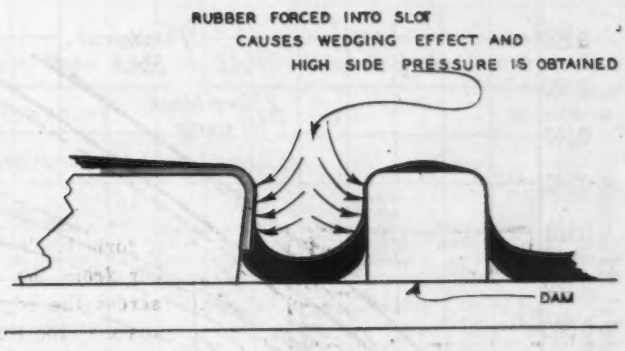


FIG. 15 — Control of rubber pressure as exercised by a dam.

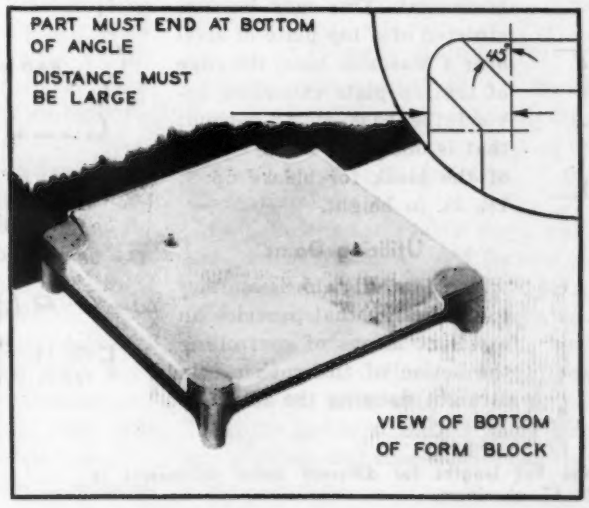


FIG. 14—Form block with a supported undercut up to vertex of angle.

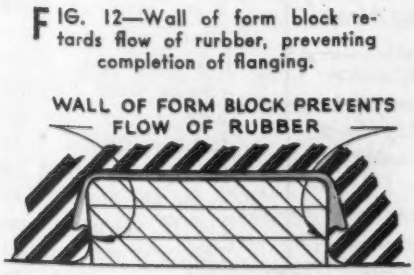


FIG. 12—Wall of form block retards flow of rurbber, preventing completion of flanging.

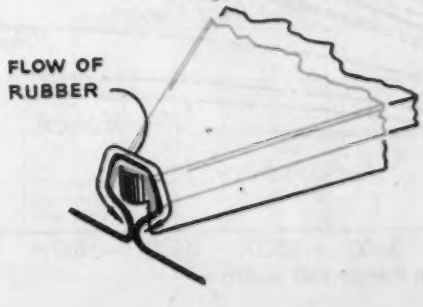


FIG. 13—Stretching of rubber does not take place under an acute angle.

Undercut Form Blocks

Several types of form blocks have been used to produce flanges. Since one design will not do all jobs, the advantages and disadvantages of each design should be determined so they can be applied properly. Narrow flanges can be produced effectively by the construction shown in Fig. 11. Rubber flows around the edge of the metal and starts under the flange. As the pressure increases, stretching caused by the rubber flowing into the undercut pulls the rubber out from under the flange and at the same time produces a pressure concentration on the flange. When rubber is not pulled out from under the flange, the condition shown in Fig. 12 is the result.

The undercut form block is very good for a flange that has a large radius, with a narrow flange flat on the edge and also a short flange flat with a small radius. Near the vertex of an acute angle rubber flowing under the plate from each side will meet underneath and the necessary stretching cannot take place. The result is shown in Fig. 13. Along with this condition a high concentration of pressure is formed on the top plate. This pressure is so great that it is beyond the elongation limit of the rubber and thus causes a tear. Parts having an acute angle can be formed on a form block that has a supported undercut up to the vertex of the angle, see Fig. 14. This design prevents the rubber meeting at the sides and also prevents the rubber elongating too much. Nevertheless, it is only suitable if the acute angle of the part is not too severe and the two ends of part are not too close. If ends of part were to be close together a rubber dam should be used.

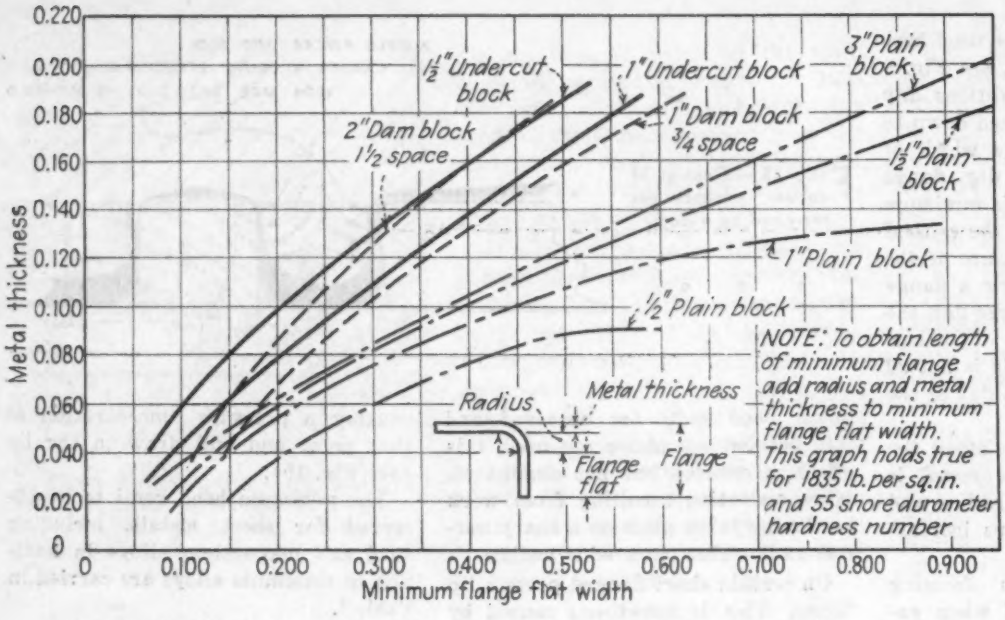
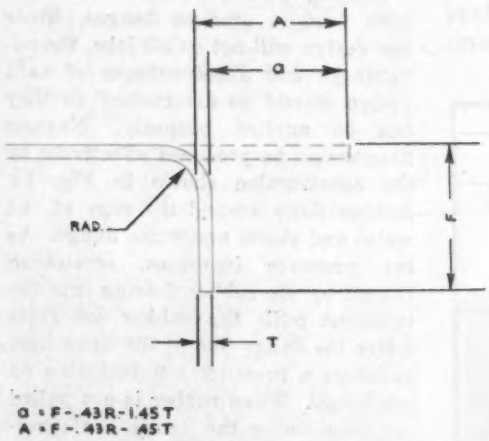

Metal thickness
Minimum flange flat width
½" Undercut block
1" Undercut block
3" Plain block
2" Dam block 1½ space
1" Dam block ¾ space
1½" Plain block
1" Plain block
½" Plain block
NOTE: To obtain length of minimum flange add radius and metal thickness to minimum flange flat width. This graph holds true for 1835 lb. per sq. in. and 55 shore durometer hardness number
Radius
Metal thickness
Flange flat
Flange

FIG. 16—Graph for minimum flange flat lengths for different metal thicknesses in 24 SO aluminum.



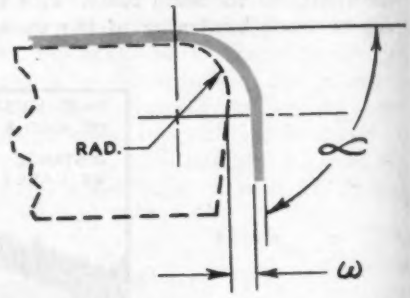
a = F - .43R - 1.45T
A = F - .43R - .45T

FIG. 18—Equations for blank size from inside or outside mold line.

A variation of the slanting undercut shown in Fig. 11 is one where the undercut is horizontal. This may be constructed of a top plate of steel over a Masonite base, the edge of the top plate extending beyond the base by an amount that is one-third of the height of the block for blocks up to 1¼ in. in height.

Utilizing Dams

The dam, Fig. 15, is another useful design that provides an excellent means of controlling the action of the rubber. On straight flanging the action of a dam can be analyzed as consisting of three factors—one which causes a high pressure concentration at the radius of the form block, another which reduces the pressure on the side of the block, and the third factor which stretches the rubber. Narrow flanges may be produced by the high pressure concentration at the radius and the stretching action keeps rubber from running under the flange. Dams will increase the accuracy of wide flanges because more bending is done on the radius. Lower pressure on the edge of the flange will reduce the tendency to bend where the flange should remain flat.



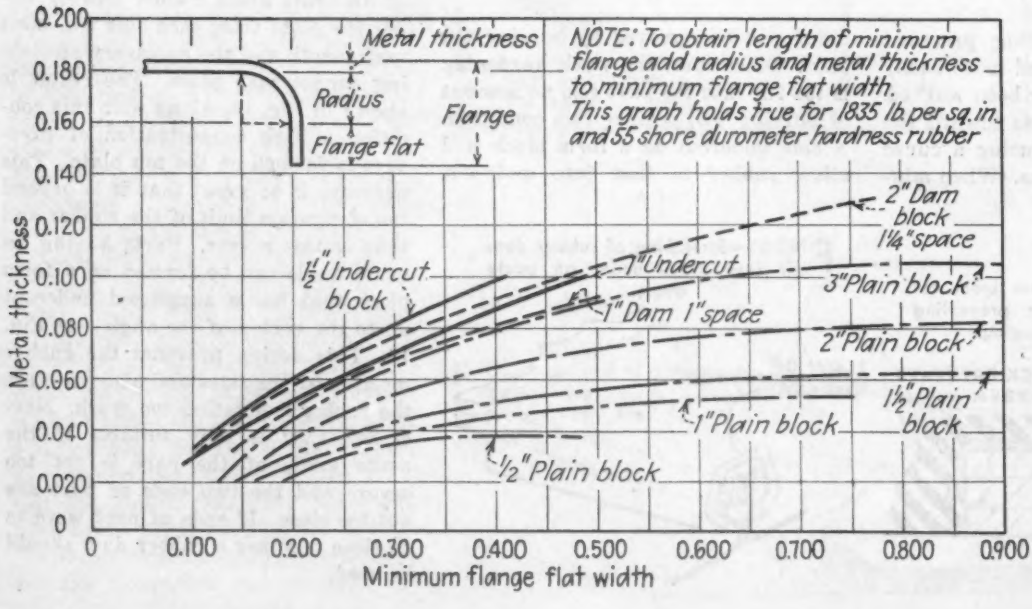
θ = SPRINGBACK ALLOWANCE

$$\omega = R - R\left(\frac{\alpha}{\alpha+\theta}\right)$$

FIG. 19—Equation giving width and radius allowance and the springback angle.

In order to get the maximum effect of the dam, its shape and dimensions must be determined for the rubber hardness and pressure at which it will be used. The effect of width was studied by forming narrow flanges on a block 2 in. high with a 2-in. retainer block (dam) placed at various distances. Best results were obtained with a 1-in. spacing. Rubber flowed into the opening about 1.3 in. so the dam can be 1½ in. deep or less. This test was carried out on a 2500-ton Lake Erie press with

FIG. 17—Graph for minimum flange flat lengths for different metal thicknesses in 24 ST aluminum.


Metal thickness
Minimum flange flat width
Metal thickness
Radius
Flange
Flange flat
NOTE: To obtain length of minimum flange add radius and metal thickness to minimum flange flat width. This graph holds true for 1835 lb. per sq. in. and 55 shore durometer hardness rubber
2" Dam block 1¼" space
½" Undercut block
1" Undercut
3" Plain block
1" Dam 1" space
2" Plain block
1½" Plain block
1" Plain block
½" Plain block

55 Shore durometer rubber at 1827 lb. per sq. in. and the results are true only for these conditions. The change of width of the flat on top of retainer block is a dimension which has only a slight effect on the width of flange.

Grouping form blocks so that one acts as a retainer block for the other has many advantages, such as saving a large amount of space, giving all parts the advantage of the dam which results in greater accuracy, stopping the pulling effect and lessening strain on the rubber. On narrow form blocks, narrow dams may be more efficient because they allow the main mass of rubber to drop lower and thus permit a high pressure concentration on the radius of the form block. This, however, may also cut or bruise the rubber; in which case, a rubber pad placed over the narrow form block and narrow retainer block will prevent tearing the rubber pad on the press.

The combination of a dam and undercut is perhaps the best method to achieve the maximum concentration of pressures. This design is best suited for short flanges in ST aluminum and heavy gages in the SO aluminum. Maximum strain on the rubber is produced whenever this design is used so that a pad or rubber should be placed over the form block. The block and dam should be constructed of Kirksite or steel. The dam should be securely doweled and screwed to a steel base of ½-in. minimum thickness. The maximum depth of undercut should be no more than 7/16 in. or else the high pressure concentrations on the radius of the form block will tend to bend the top plate. As the thickness of the top plate is reduced, the depth of undercut should be proportionately made shallower.

TABLE I
Minimum Bend Radii for Sheet Metal, in Inches

Thickness, In.	ALUMINUM ALLOYS: 24 ST and Alclad	ALUMINUM ALLOYS: 24 SO AND ALCLAD: Ht. Treated but Formed Before Age Hardening	ALUMINUM ALLOYS: 24 SO AND ALCLAD: Formed Before Heat Treating	ALUMINUM ALLOYS: 24 SO AND ALCLAD: ** 2 S Hard 3 S ½ Hard	STEEL: STAINLESS: Annealed	STEEL: STAINLESS: * ½ Hard	STEEL: Low Carbon and X-4130 Annealed	Thickness, In.	MAGNESIUM: Army 11317 Cold Bend	MAGNESIUM: Navy M-111 Hot Formed
Up to 0.015	...	...	...	...	1/32	1/32	...	0.012	1/16	1/16
0.016	3/64	1/64	1/64	...	...	...	1/32	0.016	3/32	1/16
0.020	1/16	1/32	1/64	1/32	1/32	1/16	...	0.018	1/8	1/16
0.025	5/64	1/32	1/64	1/32	1/32	...	1/32	0.020	1/8	1/16
0.030	...	...	...	...	1/32	1/16	...	0.025	3/16	1/16
0.031	...	...	...	...	...	...	1/32	0.032	1/4	3/32
0.032	3/32	1/32	1/64	1/16	...	...	...	0.040	5/16	3/32
0.038	...	...	...	...	1/16	...	1/16	0.051	3/8	1/8
0.040	9/64	3/32	1/32	3/32	...	3/32	...	0.064	1/2	3/16
0.050	...	...	...	...	1/16	1/8	1/16	0.081	5/8	3/16
0.051	3/16	1/8	1/16	3/32	...	...	...	0.102	3/4	1/4
0.063	...	...	...	...	3/32	1/8	1/16	0.125	1	5/16
0.064	7/32	1/8	1/16	1/8	...	...	...	0.187	1½	1/2
0.078	...	...	...	...	3/32	...	3/32	0.250	2	5/8
0.081	21/64	7/32	3/32	3/16	...	...	...	0.375	3	1
0.091	23/64	1/4	3/32	...	...	...	.....	.....	...	...
0.094	...	...	...	...	1/8	...	3/32	.....	...	...
0.102	...	...	...	3/16	...	...	.....	.....	...	...
0.125	...	...	...	...	3/16	...	1/8	.....	...	...
0.128	1/2	5/16	1/8	...	1/4	...	.....	.....	...	...
0.187	3/4	9/16	3/16	...	...	...	.....	.....	...	...

* For Bends up to 90 deg. only. ** Bend Radii for 52 S—Same as 2 S and 3 S.

Flanging Data

The minimum width of flat flange that can be made with different type blocks is shown on the graphs: Fig. 16 for SO material, and Fig. 17 for ST material.

Calculations for rubber press work are generally not as satisfactory as a graph determined from actual tests. Too many variables are involved and the action of metal cannot be predicted accurately. However, equations, see Fig. 18, expressing the blank size from the inside or outside mold line, are accurate and simple formulas that should be used.

Another equation, see Fig. 19, which does have a practical use, gives the width and radius allowance from the bend radius and the spring back angle.

When metal having a high spring back is bent over a large radius the width allowance will be very large. To many, this appears to be a failure of the rubber to completely form the part. Closer observation will show that it is not a failure.

The formula shown in Fig. 19 may be used to calculate the correct size of a form block to produce a part of predetermined width when the spring back is known.

[*In the concluding discussion next week, the forming of flanges and other shapes will be described.*]

Density of Metal Powder Particles

APPARENT density, flow, particle size blend and particle shape are characteristics which are currently being used to define the properties of metal powders. Of late, those working on particular problems involving metal powders have posed the question, "What is the actual density of individual powder particles?"

Upon referring to methods established by the A.S.T.M. for cement and pigments, Hardy Metallurgical Co., New York, found that this property could be determined by two methods:

ASTM Standards D 153-39, page 771
ASTM Standards C 77-40, page 45
(both in the 1942 ASTM Book of Standards)

	Solid Density	Average Particle Density	Apparent Density
Electrolytic iron A	7.87	7.80	2.2
Electrolytic iron B	7.87	7.75	2.3
Reduced iron powder	7.87	7.49	2.1
Electrolytic copper	8.93	8.86	2.3
Atomized lead	11.34	11.38	4.5

Tentative density determinations by these methods, shown in the accompanying table yielded the following comparative results in the Hardy laboratory.

It is known that the porosity of individual particles has a contributing effect on the compressibility of metal powders and the study of the average particle densities may throw light on the properties required of metal powders for powder metallurgical use.

COINING

Heavy Gage Stampings

. . . Coining of heavy gage stampings is closely akin to cold forging or upsetting. The term implies accurate sizing and work hardening of the material to higher strengths. Some of the possibilities of the process are found in examples taken from practice at the Detroit Stamping Co.

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BY STANLEY H. BRAMS

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COINING is close to being a cross between forging and stamping. The metal is handled cold, as in stamping, and flow of metal is achieved, as in forging. The result is usually a low cost manufacturing operation which is employed to produce parts which not only are within fairly limited tolerances, eliminating need for machining, but which also achieve higher hardness, thus often by-passing need for furnace treatment.

The major task in satisfactory coining operations is usually the development of dies to reach the desired end-result. Inasmuch as cold flow of metal is involved, the dies must fulfill a number of requisites. Primarily, of course, they must direct the metal along preferred flow lines, and do this in suitably overlapping stages if the job is complicated. These lines of flow must be so developed that the granular structure of the metal is strengthened rather than weakened. Secondarily, the dies have to be built to process enough pieces to justify their cost. Experience is obviously important in making coining dies.

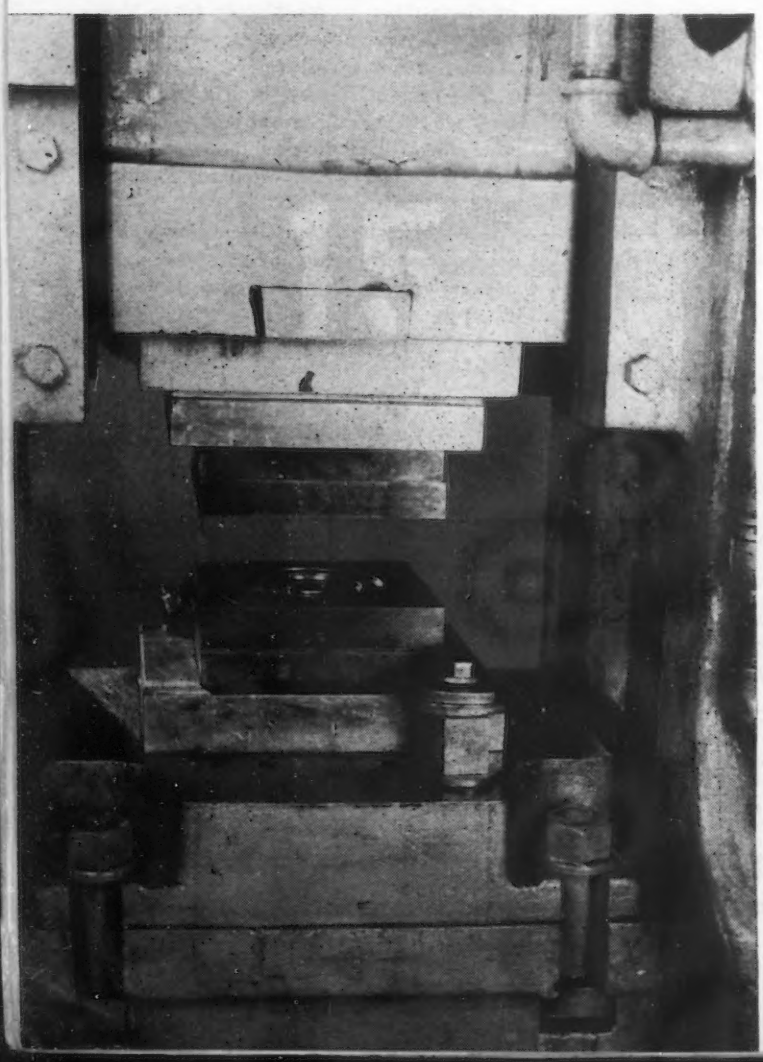

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FIG. 1—A knuckle action press is commonly used for coining work, due to the great compressive stress it develops. Note the considerable bulk of the die in the press.

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Coining tolerances are not uncommonly held within 0.0015 in. The coining process is well suited for irregular or round counterboring, two or more surface thicknesses on some part gasket or flat surfaces, close tolerance of stamped parts, burr removal and edge radius. Customarily, such finishing on small parts is achieved by grinding or other forms of machining. Coining of large areas is less practical due to the tremendous pressures required.

A knuckle action press is preferable, Fig. 1, to provide the tremendous compressive stress necessary to flow the cold metal, and to allow time for this flow during the rather long dwell at the bottom of the stroke. Speed, consequently, is necessarily slower than for blanking or drawing. This generally holds true for coining work done in crank or toggle presses.

Massive Dies

Dies are made from tool or chisel steel, air or oil hardened, depending on the work to be done, Fig. 2. Experience and experimental work dictate the amount of heat treatment necessary. In best practice coining dies are usually quite a bit bulkier than comparable stamping dies, made thus to provide extra margin of strength against the stresses imposed on the form.

In this respect, the practice at De-

troit Stamping Co., an active producer of coined stampings, is often to shrink a ring collar onto the die as a strengthening agent. Where a ring is not used, the die is made with a considerably larger surface surrounding the work area than is otherwise customary.

The Detroit concern has enlarged its coining work since the war began and has an abundant file of case histories to prove the point that the method is a major means of reducing costs. It has done work on small objects like simple washers requiring special edge or surface conditions, and it has also cold processed parts from stock as heavy as ⅜ in.

Cost savings are sometimes startling. Reductions of 75 and 80 per cent over more orthodox machining and manufacturing operations are by no means uncommon.

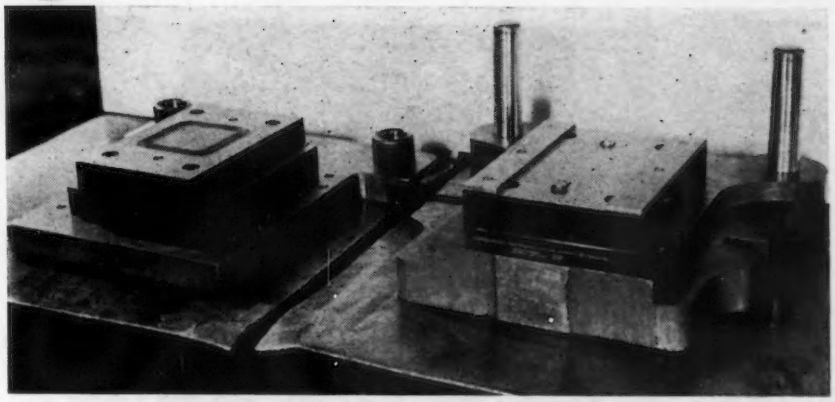

FIG. 2—Typical dies for coining are shown. Left view is the punch with coining grooves machined on surface and on the right is the die platen, which may be ground irregular to correct for flatness.

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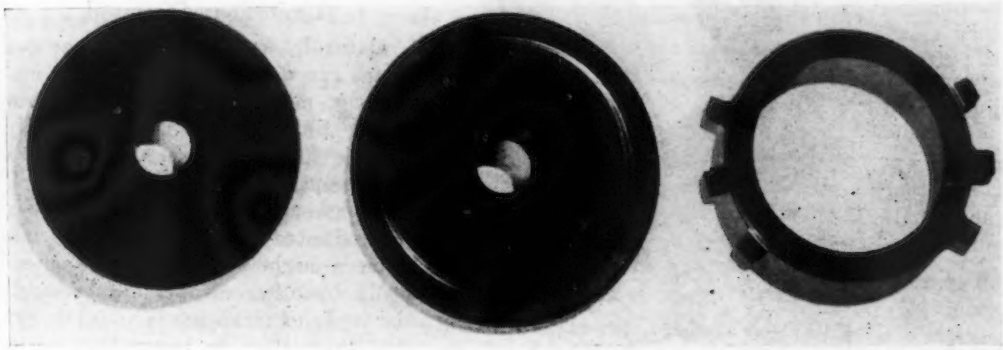

FIG. 3—A spline lock ring is coined in two steps from a washer, the first operation being the coining of the rim and the second being the trimming of the contour. Costs are a third of those of stamping and machining.

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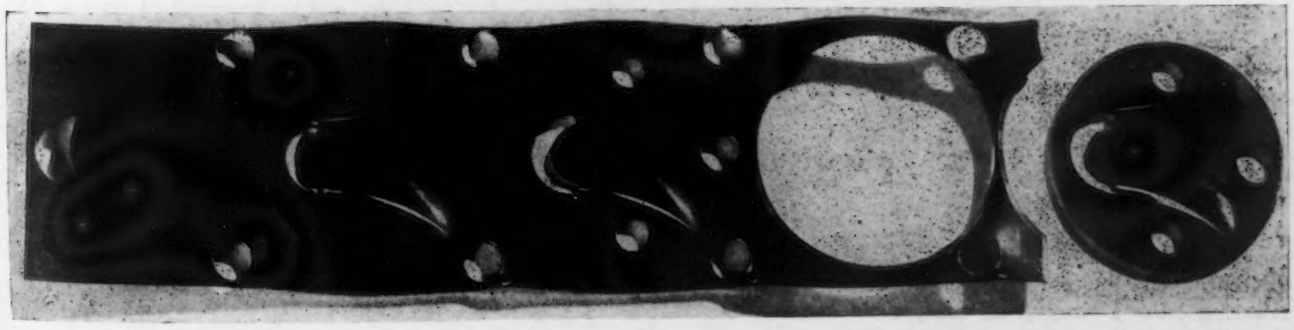
One-Third the Cost

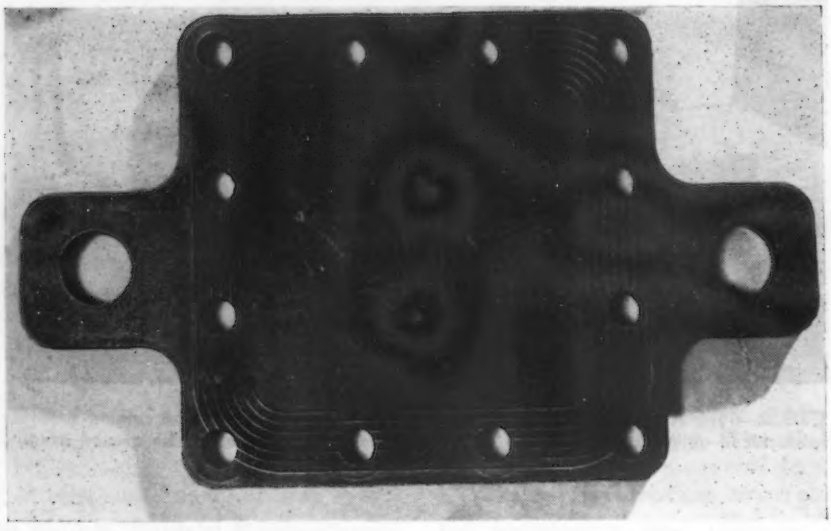
Illustrative of the work done in this plant is the spline lock ring, Fig. 3. It starts as a washer blanked from 0.078 in. chrome molybdenum steel. The rim is coined on a 250-ton press to a thickness of 0.035 in., and the contour is then trimmed. As a notable by-product of the process, Rockwell hardness on the edges is raised 30 per cent. Normally this part would be machined from a stamping, but coining costs are about a third of stamping and machining cost estimates.

A more complicated application is a valve limit retainer, Fig. 4, made with a sequence die which provides progressive piercing, coining, trimming, repiercing and blanking. A soft cold rolled steel, 0.050 in. gage, is the medium, and in the process tensile strength is raised on the limit lug by 50 per cent, increasing wear qualities to the point that heat treatment is unnecessary. The limit lip is coined within a tolerance of 0.002 in. during the reduction of gage from 0.050 to 0.020 in. Previously this part was machined from a stamping; coining reduced costs 70 per cent.

Coining of a heavier piece is exemplified in a crankcase oil sealing base, Fig. 5, made of ⅜ in. hot rolled pickled steel into which six grooves are coined into the sealing area around the bolt holes. This base is coined flat at the same time, the process eliminating an expensive grinding operation and providing an improved seal against oil seepage. The grooves

FIG. 4—The progressive development of a valve limit retainer is shown in this illustration. At left is the strip steel as it comes to the coining stage, three holes having been pierced in it. The center lift is then coined; three additional holes are then cut out and tongue end trimmed; and in the third step the finished piece, shown at right, is blanked out of the strip of metal, leaving the scrap skeleton as shown.





ABOVE

FIG. 5—This crankcase oil sealing base, produced from the die shown in Fig. 2, has grooves coined to a depth of 0.015 in. in an operation which flattens the base at the same time.

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in the face are coined to a depth of 0.015 in. through a rectangular area measuring about 5 x 4½ in.—an operation which would be manifestly expensive, if not impractical, by other means. Coining reduces by about half the cost of producing a similar piece machined from a casting.

Coining in Reverse

Sometimes the coining art has to reverse its general line of approach. An example is the engine recessed spline locking ring, Fig. 6. In this piece the metal has to be made to flow toward the inside during coining of the outer diameter thickness—just the opposite of most coining, and much more difficult than to flow the metal from the center toward the outer circumference, where it can be cut off. The thickness of the flange in this piece is 0.093 in., and the thickness of base and curved inside fingers has been reduced to 0.060 in., a dimension held to plus or minus 0.0015 in. Made of chrome molybdenum cold rolled steel, the piece was formerly produced from bar stock, machined and milled in several operations. Coining on a 400 ton press, followed by heat treating and a pressed metal re-sizing, has reduced the cost of this previous method by about 85 per cent.

Adaptations for war and peace alike abound in this shop. One in the former classification is a bomb fuse head, Fig. 7. Formerly made as a screw machine product and then as a machined forging, this head was finally converted to cold coin stamping, lowering costs a third from the previous most economical method. Three separate operations are involved on this head: Blanking, coining and trimming, with no need for annealing or machining. The piece produced has a convex, cone-tapered face on the one side with conical extruded flange on the other, meeting at a sharp edge coined down to 0.020 in. thickness. The material used is SAE 1010 strip stock sheared from sheets of 0.203 gage steel.

For peacetime uses, the adjustable support bracket for truck chassis, Fig. 8, is indicative. Used now on military trucks, this hot rolled pickled steel piece must have serrated ends to withstand excessive loads without losing adjustment. The coining of the pads at each end of the support replaces milling in two directions, and work hardening is sufficient to eliminate any need of heat treatment. Costs are about 75 per cent less than in milling.

FIG. 6—In producing this engine recessed spline locking ring, the metal has to be flowed to the center section which is then pierced out and discarded. Flange thickness is held at 0.093 in., while the adjoining base section and the curved fingers have been reduced to 0.060 in. by coining. Cost is about 15 per cent of that of previous production methods.

Limitations Discussed

Naturally, coining is not a panacea which can do away entirely with machining, milling and grinding operations. Shapes must observe fairly definite limits of size and thickness and comparatively simple dimensions. The higher costs of dies to set up a job indicates that work in loose tolerances might be done more economically by other means. Furthermore, the tricks of technique involved do not lend themselves to improvisations in tool rooms unfamiliar with such work, or in the ordinary stamping shop. Nevertheless, study of the method may produce worthwhile and economical applications for small parts producers and users.

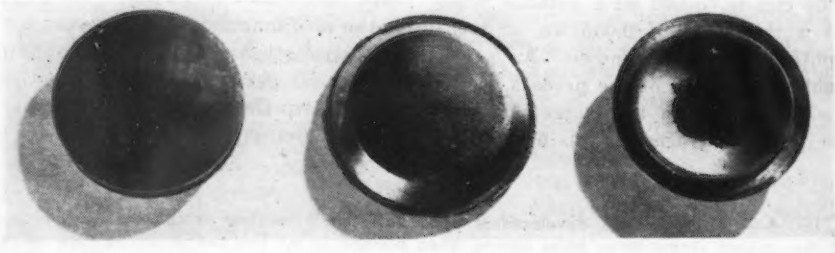

FIG. 7—Steps in the production of a bomb fuse head are shown from left to right. At left is the slug of 0.203 in. steel after blanking from strip. At center is shown the convex taper side produced from this operation, waiting trimming. At right is the reverse side of the head, coined to a conical shape with extruded flange, after trimming.

FIG. 8—Serrations on the ends of this chassis support bracket were coined, reducing milling and, as a by-product, hardening the work sufficiently to eliminate need of heat treatment.

Extending Life Of Industrial Truck Tires

By C. B. COOK
Vice-President,
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Cleveland

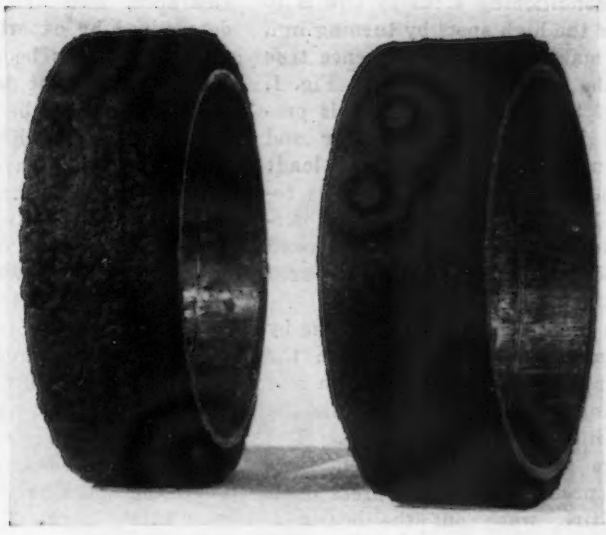


FIG. 1—Solid rubber tires on drive wheels of an industrial power truck before and after turning.

. . . A machine tool builder finds that turning or grinding down the lumps and removing the flat spots actually adds about four months to the normal life of industrial truck tires, thus not only conserving vital rubber but adding to the life of the truck.

IN the plant of Warner & Swasey Co., Cleveland, effective methods of making repairs to power truck tires have been developed by the electrical maintenance, industrial truck department. These conservation measures have resulted in longer useful life for the tires and better operating efficiency of the truck. Maximum service is obtained by making repairs before the tires have become too badly worn.

Vibration due to lumpy tires cuts down material handling efficiency, sometimes by inducing operator fatigue and sometimes by causing damage to the loads. Also, tires which are out of round will wear out very much faster; and travel vibration does the truck itself no good. These are all good reasons for keeping a watchful eye on contours as well as on thickness, particularly in plants where floor conditions tend to accelerate the rate of wear.

The principal causes of tire wear are: (1) The effect of oil or grease, (2) the effect of imbedded chips and (3) the effect of hard smashes on obstructions and pitted floors.

Oil weakens the surface of a rubber tire by changing the rubber compound to a springless, putty-like material. With the resilience and strength gone, pieces are separated from the main body of the tire, causing a hole. Holes are also caused by chips or shocks. Whatever causes a hole to develop, the condition is aggravated as the wheel turns over under heavy loads, increasing the compression on the surrounding rubber, which must take up the extra work. The result is a wasting away of the rubber at the weak point.

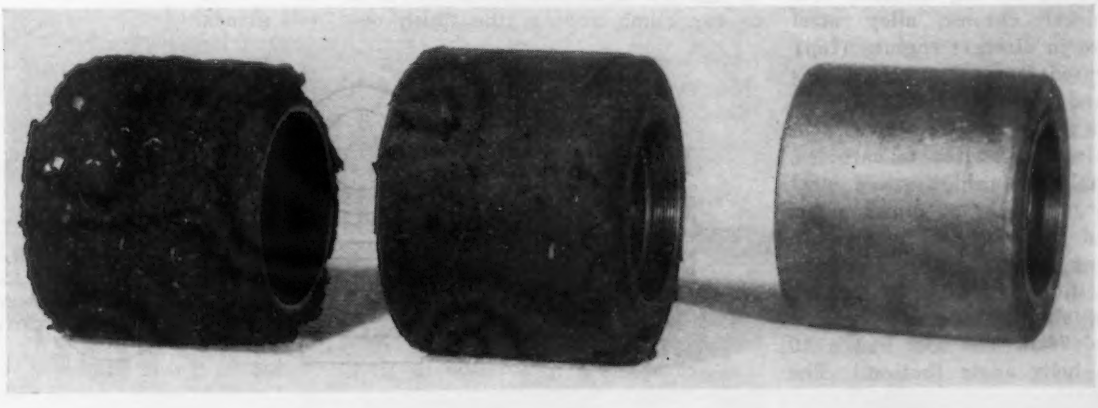
Tires which are subject to these excessive service conditions are seldom worn smooth. Larger pieces are dislodged from one section of the tire than from another and the wheel goes out of round. When the wheel becomes flat in one spot this flat spot continues to grow larger, rather than to have the corners rounded off as might be expected.

When this condition has developed to the extent of several flat spots, a truck running at 5 miles per hr. is subject to excessive vibration. The truck handles like an automobile with a bad shimmy, and the operator naturally reduces the speed in order to preserve normal control, as well as to avoid the fatigue induced by the more difficult handling.

FIG. 2 (Left)—Small tire before grinding. (Center) Similar tire after grinding. (Right) Auxiliary steel rim used to share load on heavily loaded truck tires.

Turning Tires

One satisfactory method which has been developed at Warner & Swasey



for reconditioning a lumpy tire is to remove the high spots by turning in a lathe, making the circumference true with the center of the wheel, Fig. 1. Life of the remaining rubber is prolonged by the smooth contour and more uniform distribution of load; and the efficiency of the truck is restored by enabling it to handle at normal speed. The rubber is not wasted because it usually has been so injured that it has no value.

This reconditioning can be done by chucking the entire wheel with the tire, or by pressing off the tire and replacing it with a spare while the reconditioning is being done. The average time required to remove a wheel, press off the tire, press on a spare tire, wash out the bearings, repack with grease and replace the wheel, is 2 hr.

Imbedded chips should be removed by hand, provided this can be done without leaving a large hole. Spiral turnings, on the other hand, are likely to tear out too much rubber, or cut a "biscuit." Experience has indicated that the turning tool will usually flip out such chips with least damage.

Thin Cuts Taken

The cutting tool should be ground with a considerable rake or clearance, and should present a fairly sharp edge as compared to a tool used for turning steel. It should be very rigidly clamped into the tool post. The sharp edge is fed into the tire at an upward angle. Cut should be 1/16 in. deep or less, using a slow feed with the lathe chuck turning between 300 and 500 r.p.m. Due to the wide range of rubber compounds encountered, and to variations in the conditions of the tires, the tool angle, clearance, feed and speed are best determined by experience. Synthetic rubber tires can be reconditioned by the procedure just described, but details will have to be modified to suit the material in each case.

The top worn layer of rubber is cut more easily than the subsurface layers, and chips give little difficulty, especially if the bad ones are removed before turning. A warning is usually given that a chip is going to make trouble, by the tool ticking against it before it engages solidly. Sometimes a chip is caught on the tool edge and remains there, scoring the rubber. In this case the lathe must be stopped immediately and the chip removed. The lathe operator should, of course, wear safety goggles for this work.

In the Warner & Swasey plant trucks are used on three shifts seven days a week, and tires have a normal life of one year. After turning they run about four more months before needing further attention. After the first treatment no difference is noted in the performance of the tire. After a second cutting the tires feel a little more solid; and if a third cut is possible a still more pronounced effect of solidity is noticed. Reconditioning has been estimated to add 70 to 80 per cent to the life of the tire. Care is always taken to replace tires in pairs having the same outside diameter, so as to keep the truck in a level position. Especially is this advantageous on the drive axle, reducing wear on the differential.

Wheels of smaller diameter, such as are used beneath the platforms of lift trucks, are usually not so easy to recondition by turning because of the lower peripheral speed. In this case a hub may be turned and chucked or centered in a grinder, and the rubber ground off, using a very fine 6 in. diameter wheel turning at high speed (See Fig. 2). Plenty of water must be used to wash the rubber out of the pores of the grinding wheel. As in the case of turning, it is better to remove imbedded chips before grinding small tires.

Auxiliary Steel Rims

Some trucks have a cluster of four wheels under the platform. These have molded-on tires which are very difficult to replace. This situation was met by installing steel rims to relieve the wear on the rubber when the truck is loaded. Two steel wheels, one right and one left, are provided with two rubber wheels, the steel wheels being turned ¼ in. smaller in outside diameter. The rubber tires, being larger, carry the truck when it is empty or loaded lightly. When a heavy load is placed on the platform, the rubber tires are compressed and the steel wheels take up part of the load. When lightly loaded the truck runs noiselessly and the riding qualities are much better for the operator.

Until spare tires become more readily available, tire conservation will be important, both for obtaining longer life from tires and for assuring that the trucks operate at the highest efficiency. Good housekeeping and maintenance of smooth runways will help more than anything else to conserve the rubber, but when adequate measures in this respect cannot be taken, the life of what good rubber remains in damaged tires can be prolonged by removing the lumpy surfaces to restore smoothness and roundness.

Climb Milling With Single Carbide Blade

BY changing from conventional milling with a multi-blade high speed steel shell end mill to climb cutting with a carbide flycutter, production on milling the lug shoulder of a forged nickel chrome alloy steel rocker used in aircraft engines (top) was increased from 30 to 110 pieces per hr. and the finish on the work pieces was appreciably improved.

In making the switch to carbides, an old multi-blade high speed steel shell end mill 2¼ in. in diameter, which had previously been used at low cutting speed on this job, was converted into a flycutter by tipping it with a single blade of Carboloy grade No. 78-B. The tool had a 10 deg. r. h. helix angle (bottom). The speed was increased to 550 ft. per min.; a feed of 7 in. per min. was used, and a maximum depth of cut of ¼ in. was taken. When the direction of rotation of the cutter was reversed to use climb milling, the finish obtained was materially improved.

In addition to upping production more than 300 per cent, climb cutting with the carbide flycutter also gave an average of 1500 pieces between tool grinds.

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TOP: Chrome nickel steel rocker forging on which lug is milled. BOTTOM: High speed steel shell end mill which was converted to a single bladed, carbide tipped fly cutter.

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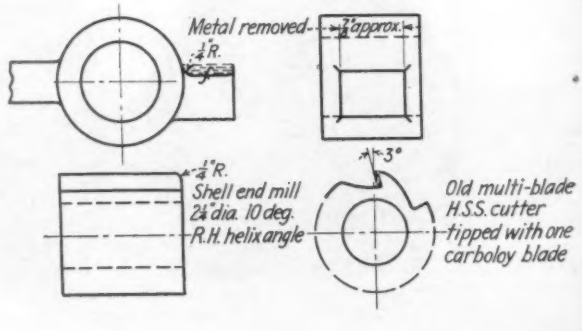
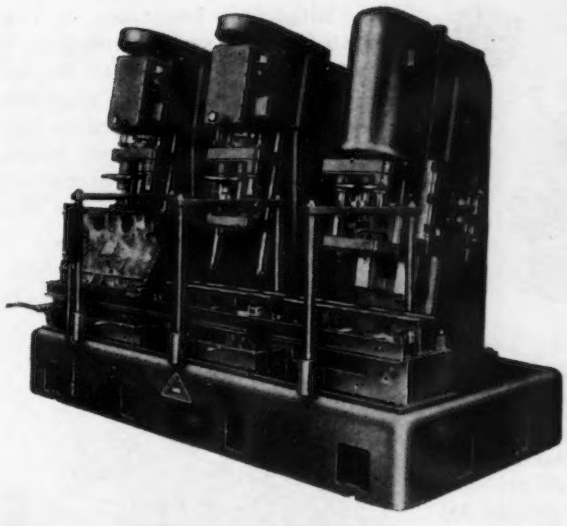


New Equipment . . .

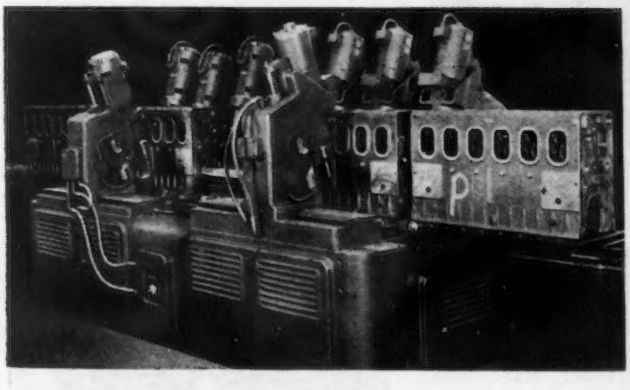
Machine Tools

. . . Automatic processing equipment, drills, grinders, millers, sawing and tapping machines are described in this week's review of latest announcements of the manufacturers.

A COMPLETELY automatic transfer-type processing machine for cylinder blocks has been announced by the *Cross Co.*, Detroit. Work is automatically picked up from the conveyor, is completely processed with automatic transfer of work from station to station, and is ejected from the machine and redelivered to the conveyor without being touched by human hands. Production is given as 45 pieces per hr. at 80 per cent efficiency. Although the machine illustrated consists of only two stations—a drilling and a tapping station—the manufacturer claims that the same principle is being used in other machines requiring many more stations



bly and slide are supported by three ways, the center way being gibbed. Clamping is manual. All operations—drilling, moving from drilling to reaming position, reaming and returning to loading position—are automatic after the cycle starter button is pressed. In case of tool trouble, an emergency return button retracts the tools from the work.



for processing intricate work necessitating a multiplicity of operations.

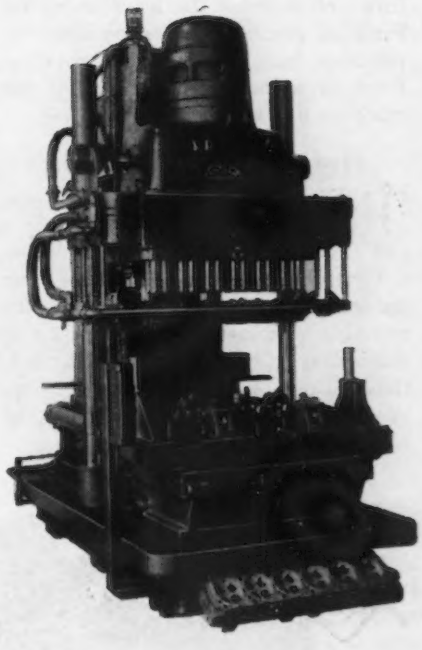
within an accuracy of 0.001 in. The drill heads of the first two stations are driven by standard No. 5000 twin ram hydraulic power units mounted at 10 deg. angle on the face of the columns. The third station has a sliding type unit.

Special Driller

FOR rough drilling holes in truck cylinder blocks through the solid casting, then semi-finishing and finish reaming them all in one cycle, a three station machine has been developed by *Le Maire Tool & Mfg. Co.*, Dearborn, Mich. By being conveyor indexed, the machine provides a progressive setup that eliminates much handling of heavy parts from one machine to another. The first station drills four holes through the solid surface of the casting. One of the holes is also counterbored and spot faced to 2⅜ in. in diameter. The second station semi-finish reams the holes. The third station finish reams two 1¼ in. holes and two 2 in. holes

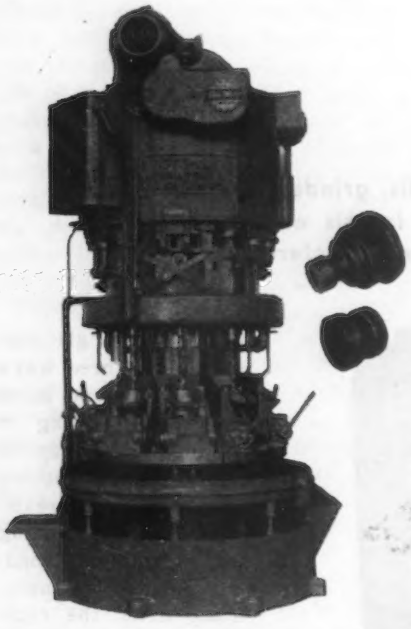
Multiple Spindle Drill

A MACHINE for drilling and reaming 24 holes in aluminum alloy aircraft cylinder heads has been announced by *Snyder Tool & Engineering Co.*, 3400 E. Lafayette Avenue, Detroit 7. The machine consists of a Snyder standard 20-V-16 drilling machine column installed upon a special base and using a special multiple head mounting bracket carrying a 48-spindle multiple drilling head and two 24-hole bushing plates. Two vertical guide bars are provided extending from the fixture base to the head casting. Rack teeth in these bars engage a pinion cross shaft and keep both ends of the head moving downward parallel to each other, thus preventing any tendency of the head to tip at either end. Fixture assem-



Automatic Driller

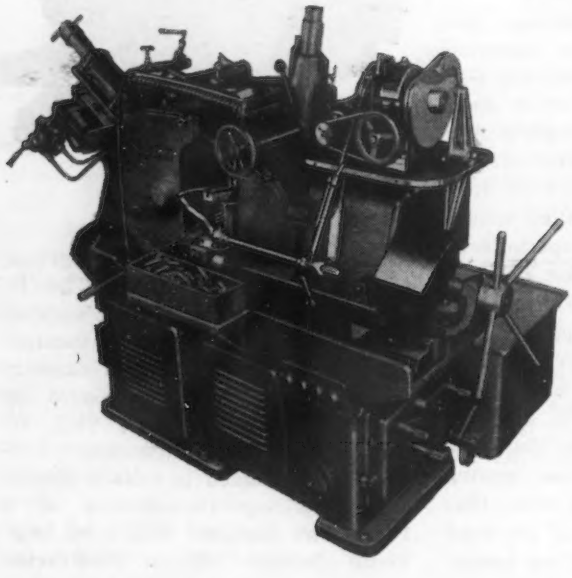
A VERTICAL Roto-Matic driller, adapted from a basic 36 in. work circle machine with 12 spindles to one with 8 spindles but incorporating the same power and capacity for work, has been developed by *Davis & Thompson Co.*, 6411 W. Burnham Street, Milwaukee. Fixtures are designed to take a cluster gear requiring the drilling of a 1 35/64 in. diameter hole 4 in. long. These fixtures are so constructed



that they can be adapted to a larger cluster gear which requires a larger diameter hole 7 in. long. Production of 126 pieces per hr. is possible. The machine is of the non-indexing type and all that is required of the operator is to lay the rough pieces into the fixture and depress the lever to clamp. Finished pieces are removed after the machine has completed a rotation. Feed of spindles and travel of the machine are automatic.

Feed for Centerless Grinder

THE Hecomatic, originally designed for automatic infeeding and chucking of 20 mm. projectiles on a Cincinnati centerless grinder, can be adapted to handle any profile grinding automatically, according to *Heckethorn Mfg. & Supply Co.*, Littleton, Colo. The Hecomatic consists of three light, compact units—the magazine, the power unit and the electric solenoid ejector. A plunger fed magazine is used to position one projectile at a time on the work rest. A cam-operated arm serves to move the table at the proper speed for fast removal of from 0.006 to 0.008 in. of stock on a piece up to approximately 1 in. in diameter, using a 60 grit wheel with the machine cycling at the rate of 900 pieces per hr. As the arm withdraws the table, a cam-operated limit switch energizes a solenoid ejector and the cycle repeats. Only a small portion of the cycle time is used for loading and ejecting. Thus production may be increased 50 per cent and more. The operator's only duties are to keep the magazine filled and check the shell dimensions.

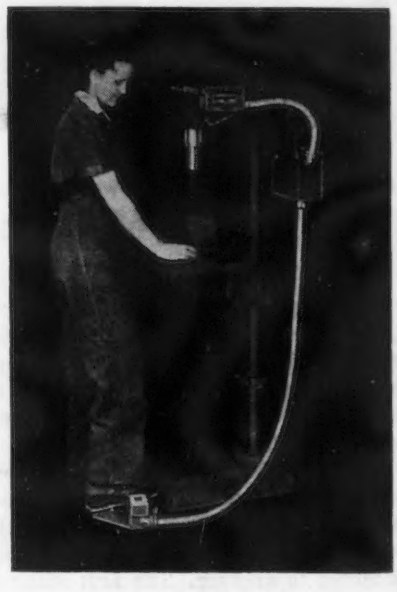


Surface Grinder

BUILT for tool room use and light production work where accuracy is paramount, a Model G-1 DoALL surface grinder has been announced by *Continental Machines, Inc.*, 1301 Washington Avenue South, Minneapolis 4. The grinder has a table travel of 21 in. and transverse travel of 7½ in. with a vertical wheel head adjustment of 12 in. using a 7 x ½ x 1¼ in. wheel. Extreme rigidity is said to be found in the scientific proportioning of the 2200 lb. weight of the machine. The column is recessed into the base to give greater rigidity to the spindle and a much greater way area for the table and saddle. The working area is completely supported, eliminating any overhanging. Transverse travel is 21 in. and cross feed travel, 7½ in. An especially constructed combined hydraulic control unit eliminates all piping, and controls the five hydraulically actuated movements of the machine. When the surface grinder is under automatic operation, the cross feed screw disengages automatically. The wheel head is raised or lowered by means of a graduated handwheel.

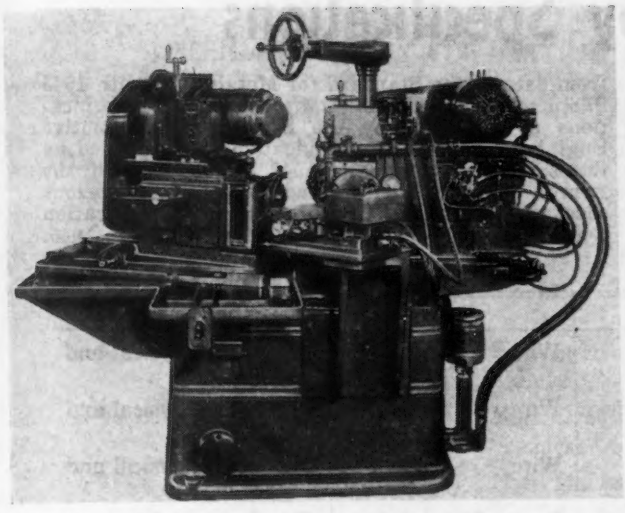
Precision Tapping Attachment

DOUGLAS MACHINERY CO., INC., 150 Broadway, New York 7, is offering a precision tapping attachment developed through its associates, the *Hunter Engineering Co.*, Riverside, Cal. The attachment provides controlled positive lead tapping and an automatic cycle. The large diameter lead screw is mounted as close as possible to the chuck to eliminate any error in lead which may be introduced by the torque or wind-up effect of the spindle under heavy load. The lead screws and meeting nuts are available in pitches from 11 to 72 thread per in. Adjustable threaded set collar is set for predetermined depth, and when pressure is applied to the foot pedal, the spindle revolves and the tap is fed into the work. As long as the foot pedal is held down, the tap will continue to enter the work until it reaches a predetermined depth, at which time it will automatically reverse, back out and stop.



Bearing Race Grinder

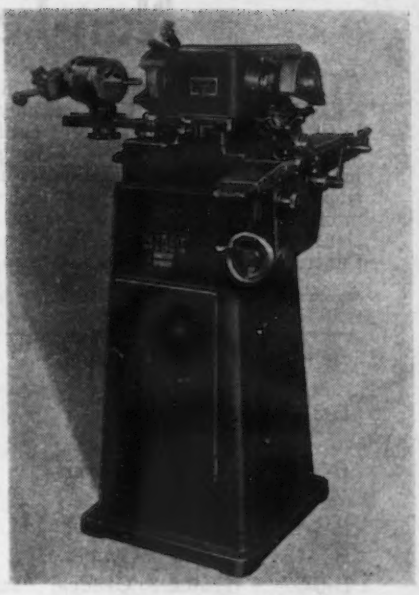
A ROLLER bearing race grinder employing a single standard Fitchburg Bowgage grinding wheelhead unit has been announced by *Fitchburg Grinding Machine Corp.*,



Fitchburg, Mass. The workhead is adjustable from 0 to 75 deg. so that the machine can be used for many other straight or taper grinding jobs. Completely automatic, by pressing a single button the wheelhead goes through its standard automatic cycle —rapid traverse to work, proper grinding feed, spark-out time and rapid return. Work is held to limits of 0.0002 in. The workhead can be arranged either hydraulically or pneumatically for collet clamping or other chucking devices. In the taper grinding application, the wheelhead is mounted on a 45 deg. slide for truing.

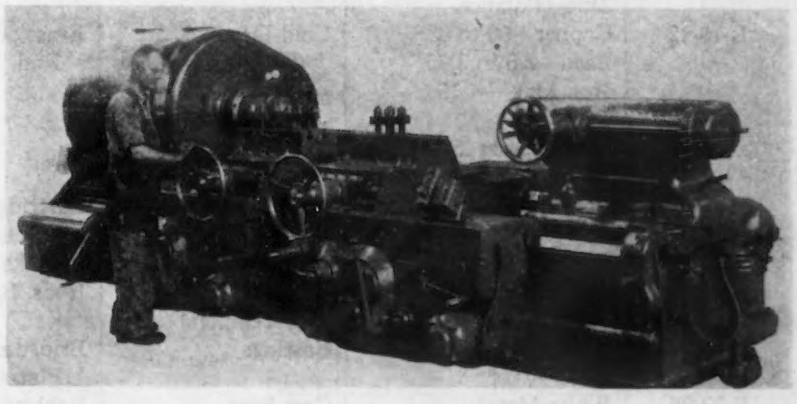
Wet Belt Surfacer

GREATER coolant capacity and more rigid construction for greater grinding accuracy have been obtained in its Model AG-8 wet belt surfacer, according to an announcement by *Porter-Cable Machine Co.*, Syracuse, N. Y. Equipped with a 35 gal. self-contained recirculating pump system, an abundance of coolant is readily available for all grinding operations. Close tolerances, often to 0.0005 in., can be obtained on the machine. Other features include a readily accessible waste clean-out drawer, a joggle type switch for easier tracking of belts, a higher table level for greater convenience to operator and a flexible tube to provide "spot" coolant where it is needed in greater quantity, and greater platen grinding area. Type AG-8 is used for grinding steel, aluminum, magnesium, glass, etc.



Shell Turning Lathe

A LATHE designed for the rough turning operation in the production of 14 and 16 in. high explosive shell has been announced by *Wickes Brothers*, Saginaw, Mich. Powered with a 75 hp. motor, the lathe has alloy steel gears throughout and anti-friction bearings on all rapid turning shafts. A hydraulic expanding mandrel drives the work which is chucked on the mandrel and on a dead center in the tailstock. Other units of the lathe include two heavy duty carriages and aprons with independent automatic feeds, power rapid traverse and quick change gear box. One carriage is fitted with a cam arrangement for feeding the tool along a curved line in order to form the nose of the shell. All controls are designed for easy operation and are conveniently located.



Tap Reconditioner

AN improved design of its tap reconditioner, Model DTR-3, on which all operations necessary for keeping taps in top condition such as chamfering, flute grinding, spiral pointing and point polishing can be performed has been made available by *Detroit Tap & Tool Co.*, 8432 Butler Street, Detroit 11. This tap reconditioner has been transformed into a 4-in-1 machine by the addition of facilities for grinding the full length of the tap flutes to the machine's original functions of chamfering, spiral pointing, and spiral point polishing. Taps with 2 to 6 flutes may be ground on one head. The entire flute grinding and spiral pointing unit is now of the sliding table type for increased accuracy and easier grinding. A feature of the improved machine is an interchangeable chamfering head which employs quick-change type collet chucks for standard tap shank sizes. The tap chamfering unit, located at the left of the machine, and the unit for flute grinding and spiral pointing will now accommodate collets from the smallest machine screw size up to 1¼ in. standard tap shank size, including long shank tapper taps.

Non-Ferrous Alloy Specifications

THE uses and inter-relationship of the many non-ferrous specifications employed in this country have always been a source of confusion where shortages must be overcome through interchangeable metals. Herein are detailed tables of all specifications for non-ferrous structural metals, their common uses and their equivalents in other specifications. These tables have been prepared by the Central Steel & Wire Co., Chicago, and are condensed from data in the Standard for Metals 1942 with 1943 Supplement of the A.S.T.M.; the A.M.S. specifications as published by the Society of Automotive Engineers, and S.A.E. specifications as published by the same society in the 1942 handbook; and the Army, Navy, Federal, and other specifications checked against the Cross-Index and Identification Code as published by General Motors Corp. in 1943.

ASTM No.	Approximate Alloy	Condition	Form	Special Requirements
B-1-40	99.9% Copper	Hard Drawn	Wire	Chemical, Physical and Electrical
B-2-40	99.9% Copper	Medium Hard Drawn	Wire	Chemical, Physical and Electrical
B-3-41	99.9% Copper	Soft or Annealed Drawn	Wire	Chemical, Physical and Electrical
B-4-42	99.9% Copper	Lake Copper	Ingots, Slabs, Cakes	Chemical and Electrical
B-5-43	99.9% Copper	Electrolytic Copper	Ingots, Slabs, Cakes	Chemical and Electrical
B-6-37	Zinc (6 Grades)	Slabs (Spelter)	Slabs	Chemical
B-8-41	Copper Wire	Concentric Lay	Stranded Conductors	Physical, Electrical and Chemical
B-9-39	Bronze (3 Qualities)	Round or Grooved	Trolley Wire	Physical and Electrical
B-11-41	Copper (4 Grades)	Hot Rolled Plates	For Locomotive Fireboxes	Chemical and Physical
B-13-41	Copper (2 Grades)	Cold Drawn (Hard or Annealed)	Boiler Tubes	Chemical and Physical
B-14-18	Copper—69% Min. Impurities—.50 Max. Zinc—Balance	Cold Drawn (Annealed Ends)	Brass Boiler Tubes	Chemical and Physical
B-16-42	Copper—60 to 63% Lead—2.5 to 3.75 Iron Max.— .15 Other Impurities .50 Max. Zinc—Remainder	Cold Drawn (2 Tempers)	Brass Screw Rod	Chemical and Physical
B-19-42	Copper—70%	Cold Rolled (7 Tempers)	Cartridge Brass Sheet, Strips and Disks	Grain Size, Physical Chemical
B-21-42T	Naval Brass (3 Grades)	Cold Finished (3 Tempers)	Rods, Bars, Shapes	Chemical and Physical
B-22-42T	Bronze (4 Classes)	Castings	Bridge and Expansion Plates	Chemical and Physical
B-23-26	White Metal (12 Grades)	Cast Bars	Babbitt Metal	Chemical and Physical
B-24-41T	Aluminum Min. 98 to 99.5% (4 Grades)	Ingots	For Remelting	Chemical
B-25-43T	Aluminum Alloy 2S Aluminum 99% Min.	Rolled (4 Tempers)	Aluminum Strip Sheet and Plate	Chemical and Physical
B-26-43T	Aluminum Base Alloys (13 Grades)	Cast	Sand Castings	Chemical and Physical
B-29-43	Lead (99.73 to 99.94% Min.) (7 Grades)	Pig	Refined Lead for Remelting	Chemical
B-30-42T	Copper Base Alloys (34 Grades)	Ingots	For Sand Castings	Chemical
B-32-40	Solder (15 Grades)	Ingots, Bars, Fabricated	Soft Solders	Chemical (Emergency Alternate only)
B-33-39	Tinned Copper	Soft or Annealed	Wire for Electrical purposes	Physical and Electrical

AMERICAN SOCIETY FOR TESTING MATERIALS SPECIFICATIONS—Continued

ASTM No.	Approximate Alloy	Condition	Form	Special Requirements
B-36-43T	Copper 65 to 95% (8 Alloys) Zinc 35 to 5%	7 Tempers	Brass Sheet and Strip	Chemical, Physical and Grain Size
B-39-22	Nickel (97.75 to 99.5% Min.) (4 Grades)	Electrolytic Shot Ingot	Nickel for Remelting	Chemical
B-42-43	Copper 99.90% Min. Phosphorus .040% Max.	Hard Drawn Seamless	Copper Pipe Standard Pipe Sizes	Hydrostatic
B-43-42	Brass (4 Grades)	Hard Drawn Seamless	Brass Pipe Standard Pipe Sizes	Hydrostatic and Chemical
B-47-39	Copper 99.9% Min.	Hard Drawn	Trolley Wire (Round or Grooved)	Physical
B-48-42	Copper 99.9% Min.	Drawn and Annealed	Round Cornered Rectangular and Square Wire for Electrical Conductors	Physical and Electrical
B-49-41	Copper 99.9% Min.	Hot Rolled Rods	Copper Rods for Electrical Purposes	Physical and Electrical
B 51-42	Phosphorus 3.5% Min. Phosphorus plus tin 99.5% Min.	Ingots	Phosphor Tin	Chemical
B-52-43	Phosphorus Plus Copper 99.75% (2 Grades)	Ingots	Phosphor Copper	Chemical
B-53-43	Silicon 10 to 30% (3 Grades)	Lumps, Ingots Slabs	Silicon Copper	Chemical
B-58-42T	Aluminum Base Alloys (13 Grades)	Ingots for Remelting	For Sand Casting	Chemical
B-60-41	88 Copper, 8 Tin 4 Zinc (3 Emergency Alloys)	Castings	Pressure Parts	Chemical and Physical (Tentative Revision See B143-42T)
B-61-42	Copper 86.5 Min. Tin 6%	Castings	Steam or Valve Parts	Chemical and Physical
B-62-41	Ounce Metal (85-5-5-5)	Castings	Leaded Red Brass	Chemical and Physical (B-145-42T May be substituted)
B-64-43	Copper Zinc Alloys (2 Grades 50.50 52-48)	Round or Long Grain, Lump	Brazing Solder	Chemical and Size
B-66-38	Bronze (4 Grades)	Rough Castings	Locomotive Wear Parts	Chemical and Fracture
B-67-38	Brass—Backs Lead Alloy Lined	Castings	Car and Tender Journal Bearings Lined	Chemical and Fracture
B-68-43	Copper 99.9% Min. (3 Types)	Annealed	Seamless Tubing	Chemical and Physical
B-69-39	Zinc	Rolled (4 Tempers)	Coiled Strip Sheet Plate	Ductility and Temper
B-72-33	Copper 99.7% Min.	Fire Refined (Other than Lake)	Bars, Cakes, Slabs, Billets	Chemical

AMERICAN SOCIETY FOR TESTING MATERIALS SPECIFICATIONS—Continued

ASTM No.	Approximate Alloy	Condition	Form	Special Requirements
B-73-29	Silver 80 to 10% (8 Grades)	Rolled Sheet or Strip Granular Cold Drawn Wire	Silver Solder	Chemical, Melting and Flow
B-74	Discontinued	Replaced by B-144-42T		
B-75-43T	Copper 99.4 to 99.92% (5 Grades)	Seamless Tubes (4 Tempers)	Copper Tubing	Chemical Physical and Electrical
B-78-42T	17S Aluminum Alloy	Rolled Annealed or Heat Treated	Duralumin Sheet and Plate	Chemical and Physical
B-79-43T	Aluminum Alloy (Mn. 1 to 1.5) (Similar to 3S)	Rolled	Sheet or Plate	Chemical and Physical
B-80-41T	Magnesium Base Alloys (8 Grades)	Sand Castings	Magnesium Castings	Chemical and Physical
B-82-41	Nickel (60%) Chrome (15%)	Annealed Drawn or Rolled Shapes	Electrical Heating Elements	Chemical and Electrical
B-83-41	Nickel (60%) Chrome (15%)	Annealed Drawn or Rolled Shapes	Electrical Heating Elements	Chemical and Electrical
B-85-42	Aluminum Base Alloy (11 Grades)	Die Castings	Alloy Die Casting	Chemical and Physical
B-86-43	Zinc Base Alloys (3 Grades)	Die Castings (Also made in Bars)	Alloy Die Castings	Chemical and Physical
B-88-41	Copper 99.9% Min.	Seamless Cold/Drawn (Hard Drawn or Annealed)	Copper Water Tube Types K, L and N.	Chemical, Physical Hydrostatic
B-89-42T	17S Aluminum Alloy	Rolled, Extruded or Cold Finished	Aluminum Alloy Bars, Rods, Wire and Shapes	Chemical and Physical
B-90-41T	Magnesium Base Alloys (6 Grades)	Hard Rolled or Annealed	Sheets	Chemical and Physical
B-91-41T	Magnesium Base Alloys (9 Grades)	Forgings	Magnesium Forging	Chemical and Physical
B-92-41	Magnesium 99.8% Min.	Ingot or Stick	Magnesium for Remelting	Chemical and Physical
B-93-41	Magnesium Base Alloys (11 Grades)	Ingot	For Sand and Dies Casting	Chemical and Physical
B-94-40T	Magnesium Base Alloys (2 Grades)	Die Castings	Magnesium Alloy Castings	Chemical and Physical
B-96-42	Copper Silicon Alloy (2 Types—11 Grades)	Hot Rolled, Cold Rolled Annealed, Half Hard	Sheets for Pressure Vessels	Chemical and Physical
B-97-41	Copper Silicon Alloy (3 Types—18 Grades)	7 Tempers	General Purpose Sheets	Chemical and Physical
B-98-42	Copper Silicon Alloy (4 Types—18 Grades)	5 Tempers	Rods, Bars and Shapes	Chemical and Physical
B-99-42	Copper Silicon Alloy (4 Types—18 Grades)	6 Tempers	General Purpose Wires	Chemical and Physical
B-100-43	Copper Alloy (2 Types)	Rolled	Expansion Plates for Bridges	Chemical
B-101-40	Copper 99.9% Lead Coated (2 Types—3 Classes)	Soft or Hard Temper	Lead Coated Copper Sheets	Lead Coating

AMERICAN SOCIETY FOR TESTING MATERIALS SPECIFICATIONS—Continued

ASTM No	Approximate Alloy	Condition	Form	Special Requirements
B-102-39T	Tin and Lead Base Alloys (5 Types)	Die Castings	Lead and Tin Base Casting	Chemical and Physical
B-103-43	Phosphor Bronze (4 Grades)	Rolled Sheet and Strip (6 Tempers)	Phosphor Bronze Sheet	Chemical and Physical
B-105-39	Copper Alloy Wire (10 Grades)	Hard Drawn Rounds	Wire for Electrical Conductors	Electrical and Physical
B-107-41T	Magnesium Base Alloys (9 Grades)	Extruded	Bars, Rods, and Shapes	Chemical and Physical
B-108-43T	Aluminum Base Alloys (12 Grades)	As Cast or Treated	Permanent Mold Aluminum Alloy Castings	Chemical and Physical
B-109-43T	52S Aluminum Alloy	Flat Sheet or Plate; Coiled Strip (5 Tempers)	Aluminum Alloy Sheet	Chemical and Physical
B-111-43	Copper and Copper Alloy (15 Grades)	Seamless Tubes and Ferrule Stock (3 Tempers)	Tubes and Ferrules for Condensers, Evaporators and Heat Exchangers	Chemical, Physical Metallographic
B-112-41T	Aluminum Base Alloys (12 Grades)	Ingots	For Permanent Mold Castings	Chemical
B-115-43	Copper 99.9% Min. Electrolytic	Lump	Cathode Copper	Chemical and Electrical
B-116-40	Copper Trolley	Deep Section Grooved Wire	For Industrial Haulage	Chemical, Electrical and Physical
B-120-41T	Beryllium (2%) Copper	Hot Rolled, Cold Rolled, Cold Drawn (As Rolled or Hardened)	Beryllium Copper Rods, Bars, Sheet, Strip, Wire	Chemical and Physical
B-121-43T	Leaded Brass (7 Grades)	Rolled and Rolled Annealed (6 Tempers)	Leaded Brass Sheet and Strip	Chemical and Physical
B-122-42T	Copper Nickel Zinc (7 Grades)	Rolled (6 Tempers)	Nickel Silver Sheet and Strip	Chemical and Physical
B-124-42T	Copper Base Alloys (12 Grades)	Rods, Bars, Shapes	For Hot Forging	Chemical and Physical
B-125-42T	Aluminum Base Alloys (9 Grades)	Ingots	For Remelting or Die Casting Alloys	Chemical and Physical
B-126-43T	Aluminum Alloy (3S)	Rolled (3 Tempers)	Sheet and Plate for Welded Pressure Vessels	Chemical and Physical
B-127-41T	Nickel (70%) Copper Alloy	Rolled (3 Tempers)	Cupro-Nickel Plate Sheet, Strip	Chemical and Physical
B-129-43	70% Cu. Cartridge Brass	Cups (2 Types)	Cartridge Cups	Chemical and Physical
B-130-43T	Gilding	Rolled (7 Tempers)	Sheet and Strip for Ammunition	Chemical and Physical
B-131-43T	90% Cu. Gilding Metal (3 Tempers)	Bullet Jackets	Cups (4 Types)	Chemical and Physical

AMERICAN SOCIETY FOR TESTING MATERIALS SPECIFICATIONS—Continued

ASTM No.	Approximate Alloy	Condition	Form	Special Requirements
B-132-41T	Manganese Bronze (2 Grades)	Sand Castings	Leaded High Strengths Yellow Brass Castings	Chemical and Physical
B-133-42T	Copper 99 9% Min	Hot Rolled or Extruded and Cold Finished (2 Tempers)	Copper Rods, Bars, Shapes	Chemical and Physical
B-134-42T	Brass (8 Grades)	Annealed and Cold Drawn (7 Tempers)	Brass Wire	Chemical and Physical
B-135-43T	Brass (5 Grades)	Annealed and Light or Hard Drawn	Misc. Brass Tubes	Chemical and Physical
B-138-43	Manganese Bronze (2 Grades)	Hot Rolled, Annealed or Cold Worked (3 Tempers)	Manganese Bronze Rods Bars and Shapes	Chemical and Physical
B-139-42T	Phosphor Bronze (5 Grades)	Cold Rolled or Drawn	Phosphor Bronze Rods, Bars and Shapes	Chemical and Physical
B-140-43	Leaded Red Brass (2 Types)	Annealed and Cold Worked (2 Tempers)	Hardware Bronze Rods, Bars and Shapes	Chemical and Physical
B-143-42T	Tin and Leaded Tin Bronze (7 Grades)	Sand Castings	Bronze Castings	Chemical and Physical
B-144-42T	High Lead Tin Bronze (9 Grades)	Sand Castings	Bronze Castings	Chemical and Physical
B-145-42T	Leaded Red Brass (4 Grades)	Sand Castings	Leaded Red and Leaded Semi-Red Brass Castings	Chemical and Physical
B-146-42T	Leaded Yellow Brass (5 Grades)	Sand Castings	General Purpose Brass Castings	Chemical and Physical
B-147-42T	High Strength Yellow Brass (3 Grades)	Sand Castings	High Strength Yellow and High Strength Leaded Yellow Brass Castings	Chemical and Physical
B-148-42T	Aluminum Bronze (3 Grades)	Sand Castings	Aluminum Bronze Castings	Chemical and Physical
B-149-42T	Leaded Nickel-Brass (4 Grades)	Sand Castings	Leaded Nickel Silicon Castings	Chemical and Physical
B-150-41T	Aluminum Bronze	Hot Rolled or Extruded: Cold Drawn or Annealed	Aluminum Bronze Rods, Bars and Shapes	Chemical and Physical
B-151-42T	Copper-Nickel-Zinc (3 Grades)	Cold Drawn (4 Tempers)	Alloy Rod and Wire	Chemical and Physical
B-152-41T	Copper (7 Types)	Hot or Cold Rolled (7 Tempers)	Copper, Sheet Strip Plate	Chemical and Physical
B-159-43T	Phosphor Bronze (3 Grades)	Cold Drawn (5 Tempers)	Phosphor Bronze Wire	Chemical and Physical
B-160-41T	Nickel (99% Min.)	Forged, Hot or Cold Rolled	Nickel Rods, and Bars	Chemical and Physical
B-161-41T	Nickel (99% Min.)	Drawn Seamless Pipe and Tubing (2 Tempers)	Nickel Pipe and Tubing	Chemical and Physical

AMERICAN SOCIETY FOR TESTING MATERIALS SPECIFICATIONS—Continued

ASTM No.	Approximate Alloy	Condition	Form	Special Requirements
B-162-41T	Nickel (99% Min.)	Hot Rolled Annealed and Pickled Cold Drawn Annealed and Polished (4 Tempers)	Nickel Sheet, Strip, Plate	Chemical and Physical
B-163-41T	Nickel, Nickel Copper and Nickel Chrome Alloys	Cold Drawn Seamless	Nickel and Nickel Alloy Tubes and Ferrule Stock	Chemical, Physical and Hydrostatic
B-164-41T	Nickel Copper (2 Alloys)	Forgings, Hot Rolled or Cold Finished	Alloy Rods and Bars	Chemical and Physical
B-165-41T	Nickel Copper Alloy	Cold Drawn Seamless	Nickel Copper Alloy Pipe and Tubing	Chemical Physical and Hydrostatic
B-166-41T	Nickel Chrome Iron Alloy	Forgings, Hot Rolled Cold Drawn	Alloy Rods and Bars	Chemical Physical
B-167-41T	Nickel Chrome Iron	Cold Finished Seamless (2 Tempers)	Alloy Pipe and Tubing	Chemical Physical and Hydrostatic
B-168-41T	Nickel Chrome Iron Alloy	Hot Rolled Cold Finished (3 Tempers)	Alloy Plate Sheet Strip	Chemical and Physical
B-169-42T	Aluminum Bronze (2 Alloys)	Cold Rolled and or Annealed (2 Tempers)	Bronze Sheet and Strip	Chemical and Physical
B-170-43T	Deoxidized Electrolytic Copper (99.92% Min.)	Wire Bars, Billets, Cakes	Oxygen free, Deoxidized Electrolytic Copper	Chemical Electrical Metallographic
B-171-42T	Copper Alloy (5 Grades)	Hot Rolled Plates	Surface Condensor and Heat Exchanger Tube Plates	Chemical and Physical
B-172-42T	Copper	Coated or Uncoated	Rope Lay Bunch Stranded Conductors	Chemical and Physical
B-173-42T	Copper	Coated or Uncoated	Rope Lay Concentric Stranded Conductors	Chemical and Physical
B-174-42T	Copper	Coated or Uncoated	Bunch Stranded Conductors	Chemical and Physical
B-175-42T	Nickel (99% Min.)	Round Wire	Wire for Lumps and Electronic Devices	Chemical, Physical and Electrical
B-176-42T	Brass (2 Alloys)	Die Castings	Alloy Die Castings	Chemical and Physical
B-178-43T	Aluminum (2S)	Rolled	Sheet and Plate for Welded Pressure Vessels	Chemical and Physical
B-184-43T	Aluminum (2 Alloys)	Coated Electrodes	Arc Welding Electrodes	Chemical and Welding
B-186-42T	Zinc Base Alloys (2 Grades)	Alloys	For Die Castings	Chemical and Physical
ES-1a	Spec. B4 or B5 Copper	Coated Copper Wire	Lead or Lead Tin Antimony Alloy Coated	Chemical, Electrical and Physical
ES-7	99.88% Min. Copper	Fire Refined	Bars, Cakes, Slabs, Billets	Chemical

AERONAUTICAL MATERIAL SPECIFICATIONS

These specifications show only generalized description of the products by types, and do not cover details of chemical composition, physical requirements, electrical requirements, or tolerances. The specification should be referred to for this information. The comparative specifications shown are approximate in all cases, as there may be differences in chemistry, physical and other requirements. Complete specifications may be obtained from Society of Automotive Engineers, New York City, N Y

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AMS No.	Approximate Alloy	Condition	Form	Similar To:
4000	Al. 99.7% Min.	Annealed	Sheet	
4001	Al. 99.0% Min (2SO)	Soft	Sheet and Strip	Navy 47A2, Type 1 and 2, Class A: Fed. QQ–A–561, Types 1 and 2, Class A; SAE 25, Soft Temper; ASTM B25–42T, Soft Temper; Alloy 2S–O.
4003	Al. 99.0% Min.	Half Hard	Sheet	Army 57–151–1, Types 1 and 2, Class ½H; Navy 47A2, Types 1 and 2, Class ½H: Fed. QQ–A–561, Types 1 and 2, Class ½H: SAE 25: Alloy 2S–½H: ASTM B25–38T half hard temper.
4006	Al. 97%, 1½% Mn (3SO)	Full Annealed	Sheet and Strip	Fed. QQ–A–359, Types 1 and 2, Condition A: Navy 47A4, Types 1 and 2, Condition A: SAE 29, Soft.
4008	Al. 97%, 1½% Mn (3S)	Half Hard	Sheet and Strip	Fed. QQ–A–359, Types 1 and 2, Temper ½H: Navy 47A4, Types 1 and 2, Temper ½H: SAE 29, ½ Hard:.
4015A	Mg. 2.5% Cr .25%, Balance Al (52S–O)	Annealed	Sheet and Strip	Navy 47A11, Types 1 and 2, Temper A: Fed. QQ–A–318, Types 1 and 2, Temper A: SAE 201, Temper Soft: ASTM B109–41T, Temper Soft: Alloy 52S–O.
4016A	Mg. 2.5%, Cr .25%, Balance Al (52S–¼H)	Quarter Hard	Sheet and Strip	Navy 47A11, Types 1 and 2, Temper ¼H; Fed. QQ–A–318, Types 1 and 2, Temper ¼H: SAE 201, Temper ¼ Hard: ASTM B109–41T, Temper ¼ Hard: Alloy 52S–¼H.
4017A	Mg. 2.5%, Cr .25%, Balance Al. (52S–½H)	Half Hard	Sheet and Strip	Navy 47A11, Types 1 and 2, Temper ½H: Fed. QQ–A–318, Types 1 and 2, Temper ½H: SAE 201, Temper ½ Hard: ASTM B109–41T, Temper ½ Hard: Alloy 52S–½H.
4025	Mg. 1%, Si .6%, Cu. .3%, Cr .3% Balance Al (61S–O)	Annealed	Sheet and Strip	Air Corps 11326, Condition A.
4026	61S W	Solution Heat Treated	Sheet and Strip	Air Corps 11326, Condition W.
4027	61S T	Heat Treated Quenched and Aged	Sheet and Strip	Air Corps 11326, Condition T.

AERONAUTICAL MATERIAL SPECIFICATIONS—Continued

AMS No.	Approximate Alloy	Condition	Form	Similar To:
4035A	24S–O	Annealed	Sheet and Strip	Navy 47A10, Condition A: Fed. QQ–A–355, Condition A: SAE 24, Temper O: Alloy 24S–O.
4037A	24S–T	Heat Treated	Sheet and Strip	Navy 47A10: Condition T: Fed. QQ–A–355, Condition T: SAE 24, Temper T: Alloy 24S–T.
4040A	24S–O	Al. Covered Annealed	Alclad Sheet and Strip	Navy 47A8, Condition A: Fed. QQ–A–362, Condition A: Alloy Alclad 24S–O.
4041A	24S–T	Al. Covered Heat Treated	Alclad Sheet and Strip	Navy 47A8, Condition T: Fed. QQ–A–362, Condition T: Alloy Alclad 24S–T.
4042A	24S–RT	Al. Covered Heat Treated and Cold Worked	Alclad Sheet and Strip	Navy 47A8, Condition TR: Fed. QQ–A–362, Condition TR: Alloy Alclad 24S–RT.
4062	Al. 99.0% Min. (2S–½H)	Half Hard	Seamless Tubing	Navy 44T19: Fed. WW–T–783: SAE 25: Alloy 2S–½ Hard.
4070B	52S–O	Annealed	Seamless Tubing	Navy 44T32, Temper A: Fed. WW–T–787: SAE 201: Alloy 52S–O.
4076A	53S–W	Quenched	Seamless Tubing	Army 11327, Condition W: Navy 44T30, Condition W: Fed. WW–T–790, Condition W: Alloy 53S–W.
4080B	61S–O	Annealed	Seamless Tubing	Fed. WW–T–789, Condition A: Alloy 61S–O.
4082B	61S–T	Heat Treated and Aged	Seamless Tubing	Fed. WW–T–789, Condition T: Alloy 61S–T.
4088A	24S–T	Heat Treated	Seamless Tubing	Army 10235, Condition B: Navy 44T28, Condition T: SAE 24, Temper T: Alloy 24S–T.
4118B	17S–T	Heat Treated	Rolled Rod, Bars or Shapes	Navy 46A4, Condition T: Fed. QQ–A–351, Condition T: SAE 26, Condition T: ASTM B89–42T, Heat Treated: Alloy 17S–T.
4120A	24S–T	Heat Treated	Rolled Bars	Navy 46A9, Condition T: Fed. QQ–A–354, Condition T: Alloy 24S–T.
4125A	A–51S–T	Quenched and Aged	Forgings	Navy 46A7, Grade 3: Fed. QQ–A–367, Grade 3: SAE 280: Alloy A51S–T.
4130A	25S–T	Quenched and Aged	Forgings	Navy 46A7, Grade 2: Fed. QQ–A–367, Grade 2: SAE 27, Temper T: Alloy 25S–T.
4135A	14S–T	Quenched and Aged	Forgings	Navy 46A7, Grade 5: Fed. QQ–A–367, Grade 5: Alloy 17S–T.
4140A	18S–T	Quenched and Aged	Forgings	Navy 46A7, Grade 7: Fed. QQ–A–367, Grade 7: Alloy 18S–T.
4145B	32S–T	Quenched and Aged	Forgings	Navy 46A7, Grade 6: Fed. QQ–A–367, Grade 6: Alloy 32S–T.

AERONAUTICAL MATERIAL SPECIFICATIONS—Continued

AMS No.	Approximate Alloy	Condition	Form	Similar To:
4150	61S-T	Heat Treated	Extruded Bars and Shapes	Alloy 61S-T.
4151	17S-T	Heat Treated	Rods, Bars and Shapes (Extruded)	Navy 46A4, Condition T: Fed. QQ-A-351, Condition T: SAE 26, Condition T: ASTM B89-42T, Heat Treated: Alloy 17S-T.
4152B	24S-T	Heat Treated	Extruded Rods, Bars and Shapes	Navy 46A9, Condition T: Fed. QQ-A-354, Condition T: SAE 24, Temper T: Alloy 24S-T.
4210B	Si. 5% (Aged)	Treated	Al. Alloy Sand Castings	Fed. QQ-A-601, Class 10 HT3: Navy Aeronautical M-212, Class No. 10, HT4: SAE 322, HT4: ASTM B26-41T, Alloy M, HT3: Alloy 355-T51.
4212B	Si. 5% (Solution and Precipitation)	Treated	Al. Alloy Sand Castings	Fed. QQ-A-601, Class 10, HT1: Army Navy Aeronautical AN-QQ-A-376, Class A: SAE 322, HT2: ASTM B26-41T, Alloy M, HT2: Alloy 355-T6.
4214A	Si. 5% (Solution and Over Aged)	Treated	Al. Alloy Sand Castings	SAE 322: Alloy 355-T71.
4217	Si. 7%	Treated	Al. Alloy Sand Castings	Army Navy Aeronautical AN-QQ-A-394: ASTM B26-41T, Alloy M, HT2: Fed. QQ-A-601, Class 3, HT2: SAE 323, HT2: Alloy 356-T6.
4220A	Al. Cu. Ni. Mg.	Treated	Sand Castings Air Cooled Cylinder Heads	
4222	Al. Cu. Ni. Mg.	Solution and Stabilized	Sand Castings	Alloy 142-T77.
4231	Al.-Cu. (4%)	Solution and Precipitation	Castings	Fed. QQ-A-601, Class 4, HT2: Army Navy Aeronautical AN-QQ-A-390, Class 2: SAE 38, HT2: ASTM B26-41T, Alloy G; HT2: Alloy 195-T6.
4234	Al., Secondary Cu. 4%	Solution and Precipitation	Sand Castings	Army Navy Aeronautical AN-A-5, Class 2: SAE E-325: Alloy S195-T6.
4240A	Al. Mg. 10%	Treated	Sand Castings	Army Navy Aeronautical AN-QQ-A-392: SAE 324: Alloy 220-T4.
4280A	Al. Si. 5%	Solution and Over Aged	Permanent Mold Castings	Army Navy Aeronautical AN-QQ-A-376, Class B: SAE 322: Alloy 355-T71.
4282A	Al. Cu. 4%, Si. 2%	Solution and Precipitation	Permanent Mold Castings	Army Navy Aeronautical AN-QQ-A-383, Class 2: Navy 46A15, Class #4: Alloy #AL-D-195, HT2: ASTM B108-41T, Alloy BS4, HT2: Alloy B195-T6.

AERONAUTICAL MATERIAL SPECIFICATIONS—Continued

AMS No.	Approximate Alloy	Condition	Form	Similar To:
4284	Al. Si. 7%	Solution and Aged	Permanent Mold Castings	Fed. QQ A 396, Alloy AL 356, HT1: Navy 16A15, Class 8, Alloy AL 356, HT1: ASTM B108 41T, Alloy 10, HT1: Alloy 356-T6.
4290A	Al. Si. 12%	Uniform	Die Castings	Army Navy Aeronautical AN-QQ A 366, Alloy 13: SAE 305: ASTM B85 39T, Alloy 5:
4291	Al. Si. 8%, Cu. 4%	Uniform	Die Castings	Army Navy Aeronautical AN QQ A 366, Composition AL 85X: Ordnance Specification AXS679: SAE E 306.
4292	Al. Si. 11%	Pressure Molded	Alloy Castings	Army Air Force 11347: Aluminum Alloy 13X.
4350A	Mg. Al. 6%, Zn. 1%	Extruded	Bars and Forgings	Air Corps 11320, Grade 1: Navy M 314, Alloy 8: SAE 520, Alloy J 1: Alloy C57S.
4360	Mg. Al. 9%, Zn. .5%	Uniform	Forgings	Air Corps 11321: Navy M126, Grade 9: ASTM B107 38T, Alloy 9.
4370	Mg. Mn. 1.2% Minimum	Annealed	Sheet	Army 11317, Grade A: Navy M 111d, Alloy 11, Condition A: ASTM B90 41T, Alloy 11: SAE 51.
4380	Mg. Al. 6%, Zn. 1%	Annealed	Sheet	Army 11317, Grade 2, Condition A: Navy M 111, Alloy 8, Condition A: Alloy C 57S: Alloy J-1.
4381	Mg. Al. 5%, Zn. 1%	Hard Rolled	Sheet	Army 11317 Grade 2, Condition H: Navy M 111, Alloy 8, Condition H: Alloy C 57S: Alloy J 1.
4420B	Mg. Al. 6%, Zn. 3%	Uniform	Sand Castings	Army Navy Aeronautical AN-QQ M-56, Composition A, Condition AC: SAE 50, Condition as cast: ASTM B80-41T, Alloy #4, Condition as cast.
4422B	Mg. Al. 6%, Zn. 3%	Solution Heat Treated	Sand Castings	Army Navy Aeronautical AN QQ-M 56, Composition A, Condition HT: SAE 50, Condition Heat Treated: ASTM B80-41T, Alloy 4, Heat Treated.
4424B	Mg. Al. 6%, Zn. 3%	Solution Precipitation	Sand Castings	Army Navy Aeronautical AN-QQ-M-56, Composition A, Condition HTA: SAE 50, Condition Heat Treated and aged: ASTM B80-41T, Alloy 4, Condition Heat Treated and Aged.

AERONAUTICAL MATERIAL SPECIFICATIONS—Continued

AMS No	Approximate Alloy	Condition	Form	Similar To:
4434A	Mg. Al. 9%, Zn. 2%	Solution Precipitation	Sand Castings	Army Navy Aeronautical AN-QQ-M-56, Composition B, Condition HTA: SAE 500, Condition Heat Treated and Aged: ASTM B80-41T, Alloy #17, Condition Heat Treated and Aged.
4490A	Mg. Al. 9%, Zn 1%	Uniform	Die Castings	Air Force 11319: Navy 46M11: Navy Aeronautical M-369, SAE 501: ASTM B94-40T, Alloy 13.
4500	99.90% Copper	Cold Finished and Bright Annealed	Sheet	Fed. QQ-C-501: Navy 47C2: SAE-71.
4505A	70% Copper, 30% Zinc	Annealed	Sheet and Strip	Fed. QQ-B-611 Composition E: ASTM B36-41T, #6: SAE 70, Grade A.
4510A	95% Copper, 5% Tin	Spring Temper	Phosphor Bronze Strip	Fed. QQ-B-746, Type VI, Grade A Spring Temper: Navy, 46B14, Temper Spring: SAE 77, Grade A: ASTM B103-42T, Temper Spring.
4520A	Cu 88%, Tin 4% Zinc 3.25% Lead 4%	Rockwell B72-90	Bronze Strip	SAE-791.
4555	Cu. 68%, Lead .80% Max., Remainder Zinc	Light Annealed	Brass Tubing	Fed. WW-T-791, Grade 2, Type A: Navy 44T15, Grade 2, Type A: SAE 74, High Brass: ASTM B135-40T, Alloy #2 and #3.
4610B	Cu. 61.5%, Lead 3%, Balance Zinc	Half Hard Temper	Free Cutting Brass Rod and Bars	Fed. QQ-B-611, Composition B: Half Hard: ASTM B-16-42: SAE-72: Naval Aircraft Factory EMS41.
4611	Cu. 61%, Tin 1% Remainder Zinc	Half Hard Temper	Naval Brass Rod and Bars	Fed. QQ-B-636, Type 1 and 2 Half Hard: Navy 46B6, Type 1 and 2, Half Hard: SAE 73, Half Hard, ASTMB 21-40T, Grade A, Half Hard.
4612	Cu. 61%, Tin 1% Remainder Zinc	Hard Temper	Naval Brass Rods and Bars	Fed. QQ-B-636, Type 1 and 2, Hard: Army-Navy Aeronautical AN-QQ-B-646: ASTMB-21-40T, Grade A, Hard.
4614B	60% Cu., 2% Lead, Remainder Zinc	Brinell 70-120	Brass Forgings	Fed. QQ-B-611, Composition A: SAE 88: ASTMB124-42T, Alloy #2.
4615	Si. 3%, Manganese or Zinc 1.5 Max., Lead .2 to .8%, Cu. Remainder	Hot Rolled or Extruded, and Cold Finished, then Stress Relieved Annealed	Silicon Bronze Rods and Bars, Hard Temper	ASTMB98 42, Type D, Temper Hard.
4619	Cu. 58%, Iron 1% Al. 1%, Manganese .5% Max., Zinc Remainder	Specifies Physicals	Manganese Bronze Forgings	

AERONAUTICAL MATERIAL SPECIFICATIONS—Continued

AMS No.	Approximate Alloy	Condition	Form	Similar To:
4625B	Cu. 95%, Tin 4Æ% Phosphorus .03 to .35: to equal 99.5%	Hard Temper	Phosphor Bronze Rods and Bars	Fed. QQ-B-746, Type 1, 2 and 3, Grade A, Temper Hard: Navy 46B14. ASTMB139-42T, Grade A.
4630A	Cu. 90%, Al. 8.5% Iron 1.5 Max.	Hot Rolled, Drawn or Extruded. May be Cold Finished. Specified Physicals	Aluminum, Bronze Bars, Shapes and Forgings	Fed. QQ-B-671, Grade B: ASTMB-148-42T.
4631	Al. 7.25%, Si. 2%, Cu. Remainder	Cold Drawn and Annealed	Aluminum, Silicon, Bronze, Rods, Bars and Forgings	
4632	Cu. 90%, Al. 8Æ%, Iron 1.5 Max.	Hot Rolled, Drawn, or Extruded. May be Cold Finished	Aluminum, Bronze Rods and Bars	Fed. QQ-B-671, Grade B: ASTMB-148-42T.
4635	Cu. 87%, Al. 10%, Iron 3%	As Rolled, Extruded, or Forged. Strain Relieved	Aluminum, Bronze	
4640	Cu. 81%, Al. 10%, Iron 3%, Nickel 5%, Manganese 1%	Hot Rolled, Drawn, Extruded or Cold Finished	Aluminum, Bronze Bars and Shapes	
4650A	Beryllium 1.9 to 2.2, other additive elements .5 Max., Copper remainder	Solution Treated and Cold Drawn	Beryllium Copper Rods, Bars and Forgings	Army 11070, Type 1, Condition H: ASTMB120-40T Condition H.
4665	Si. 2.75 to 3.5, Manganese or Zinc 1.5 Max., Remainder Copper	Soft Annealed	Copper, Silicon, Bronze, Seamless Tubing	Army 57-192-1: Navy 42T23.
4710	Cu. 64 to 67.5%, Lead .10 Max., Iron .05 Max., Zinc Remainder	Annealed Basic Brass Wire	Brass Wire, Tinned	
4720A	Cu. 95%, Tin 3.5 to 5.8, Phosphorous .03-.35: Total 99.5% Min.	Spring Temper	Phosphor Bronze Spring Wire	Fed. QQ-W-401: Navy 22W5: SAE 81: ASTMB159-42T, Grade A.
4750	Tin 50%, Lead 50% Approximate	Lead Tin Solder Melting range 315° to 420° F.	Wire, Strip, Bars, Ingots	Navy 46S14, Grade A: Fed. QQ-S-571, Grade A: ASTMB-32-21, Class A, Grade #1: SAE #1, Class A.
4755	Lead 94% to 95%, Silver 5% to 6%, Total—99.9% Min.	Wire, Strip, Bars, Ingots Melting Range 580° to 700° F.	Lead, Silver Solder	Army 57-99-1, Navy Aeronautical M-254.
4770	Silver 50%, Copper 14.5% to 16.5%, Zinc 14.5% to 18.5% Cadmium 17%-19%	Wire, Strip, Pig, Granular Melting point 1160° Max. Flow point 1175° F.	Silver Brazing Alloy	Fed. QQ-S-561, Class 4: Navy 47S13, Grade 4.
4800	Sn. 90% Min. Sb 5%, Cu. 5%	Cast	Babbitt Bearings With Steel or Bronze Back	Fed. QQ-M-161, Grade 1: ASTM B-23-26, Alloy 1: SAE 10.

AERONAUTICAL MATERIAL SPECIFICATIONS—Continued

AMS No.	Approximate Alloy	Condition	Form	Similar To:
4805	Cu. 90% Sn. 10%	Sintered	Oil Impregnated Bushings	
4815A	Ag. 99.75% Min.	Electro Plated	Silver Plated on Steel Backs for Bearings	
4817	Ag. Cu. 1.25% Maximum	Cast Linings	Bearing Metal Steel Backs	
4820	Cu. 70%, Pb. 30%,	Cast	Steel Back Bearings	SAE 48.
4822	Cu. 72%, Pb. 25%, Sn. 3%	Cast	Steel Back Bearings	SAE 481.
4825	Cu. 75%, Pb. 15%, Sn. 10%	Cast	Steel Back Bearings	
4827	Cu. 80%, Sn. 10%, Pb. 10%	Cast	Steel Back Castings	SAE 792.
4840	Cu. 70%, Pb. 25%, Sn. 5%	Cast	Cast Bearings	Navy 46B22, Grade 5: ASTM B66-28, Soft Bronze Alloy.
4842	Cu. 80%, Sn. 10%, Pb. 10%	Cast	Cast Bearings	SAE 64
4845A	Cu. 86 to 89%, Tin 9 to 11%, Zinc 1 to 3%	Specified Hardness as Cast	Bronze Casting	Fed. QQ-B-691, Composition 5: Navy 46M6: SAE 62: ASTM-B60-36.
4855	Cu. 84 to 86%, Tin 4.25 to 5.75%, Lead 4½ to 6%, Zinc 4 to 6%, Nickel 1% Max.	As Cast	Bronze Casting	Fed. QQ-B-691, Composition 2: Air Corps 11306, Grade A: Navy 46B23: ASTMB145-41T, Designation 4A: SAE 40.
4860	Copper 55 to 60%, Zinc 38 to 42%	As Cast	Manganese Bronze Casting	Fed. QQ-B-726: Navy 49-B-3: ASTMB54-27: SAE 43.
4862	Cu. 63 to 68%, Al. 3 to 6%, Manganese 2½-5%, Iron 2 to 4%, Tin .50 Max., Lead .20 Max. Zinc 19½ to 23½. Total named elements: 99.75% Min.	As Cast	High Strength Manganese Bronze Casting	Navy 46B29, Class A.
4871	Cu. 83½% Min. Al. 10½ to 11½%, Iron 3 to 4%, Manganese .1 to .5%, Nickel .5% Max. Total named elements: 99.7% Min.	Heat Treated (Quenched and Tempered)	Aluminum Bronze Castings	Air Corps 11076.
7320	Cu. 78 to 82%, Tin 15 to 17%, Lead 4 to 6%	As Cast Rockwell B72 to 82	Cast Bronze Sealing Rings	
7322	Cu. 78 to 82%, Tin 18 to 19½%, Lead .5 Max., Iron .5 Max., Zinc .5 Max.	As Cast Rockwell B85 to 92	Cast Bronze Sealing Rings	

U. S. ARMY SPECIFICATIONS

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Spec No.	Approx Comp.	Form	Similar to ASTM
57-18A Gr. A	99.5% Tin	Tinfoil	
57-18A Gr. B	98% Tin	Tinfoil	
57-23A Gr. A	99.9% Silver	Various	
57-23A Gr B	92.1% Silver, Bal Cu	Silver Alloy	
57-23A Gr. C	89.6% Silver, Bal Cu	Silver Alloy	
57-55	60% Ni, 23% Cu Iron Manganese Alloy	Billets	B 164
57-72 Gr 1	92.5% Min. Al 3 to 7% Silicon	Castings	B 108, 9 or 9A B 125 No. 4
57-72 Gr. 1D	Al — 3% Cu	Castings	
57-72 Gr 2	95% Al 2½% Cu 2% Mn	Castings	
57-72 Gr. 3	92% Min. Al	Castings	
57-72 Gr. 4	92% Min. Al 4% Cu, 3% Si	Castings	
57-72 Gr 4A	Al, — 3½% Magnesium	Castings	B 26 Gr. G1
57-72 Gr. 5	Al, — 8% Copper (SAE 30)	Castings	
57-72 Gr. 6	88% Al, 10% Cu	Castings	B 26 B 108 #4
57-72 Gr. 7	90% Al, 7% Cu 3% Zinc	Castings	B 108 #2
57-72 Gr. 8	80% Min. Alum	Castings	
57-74-1D Gr. 1	6% Al, 3% Zinc Bal. Magnesium	Sand Castings	B 80 Gr. 4 and 4X
57-74-1D Gr. 2	1.2% Manganese Bal Magnesium	Sand Castings	B 80 Gr. 11
57-92-1B	2.5% Antimony Remainder Lead	Bullet Cores	
57-92-2	Pb Ba Ca Alloy — 98-1 — 75		
57-93-2A Cl. A	Zn Die Casting Alloy	Die Castings	B 86 Gr. 23
57-93-2A Cl. B	Zn Die Casting Alloy	Die Castings	B 86 Gr. 25

U. S. ARMY SPECIFICATIONS—Continued

Spec. No.	Approx. Comp.	Form	Similar to ASTM
57-98 Gr. A.	43% Tin, 43% Lead 14% Bismuth	Solder	
57-98 Gr. B	67% Bismuth, 16 Lead, 17 Tin	Solder	
57-99-1	94.9% Lead, 5 to 6% Silver	Solder	
57-151-1A	99% Aluminum	Plate Sheet	B 25
57-152-2A	17 S—Aluminum Alloy	Sheet	B 78
57-154A	Nickel Chrome Alloy	Various	B 163, 166, 167, 168
57-154-1A	99.94 Cu + Ag	Special Rod	B 170
57-160	Low Brass	Sheet and Strip	B 36 Grade 4
57-160	Rich Low Brass	Sheet and Strip	B 36 Grade 3
57-161-2	60% Cu, 2% Lead	Brass Forgings	B 124
57-162-1	Naval Brass	Bars and Rods	B 21 Gr. A
57-171	Gilding Metal	Various	B 36 Gr. 2
57-171-1B	Gilding Metal	Various	B 36 Gr. 2
57-171-2	95% Cu	Sheet and Strip	B 36 Gr. 1
57-171-3	Gilding Metal	Bullet Cup	B 131
57-172-1C	70% Cu	Cartridge Sheet	B 19, B 36
57-172-2B	70% Cu	Cartridge Cups	B 129
57-173B	70% Cu	Cartridge Brass	B 19, B 36
57-174A	Ni 75%, Cr 15%, Fe 9%, Mn 1%	Ni Cr Alloy	B 166, B 167, B 168
57-187-2B Gr. 17	17 S—Aluminum Alloy	Tubing	B 78, B 89
57-187-2B Gr. 24	24 S—Aluminum Alloy	Tubing	
57-187-3	52 S—Aluminum Alloy	Tubing	
57-192-1B	Zn 5%, Tin 2%, 1% Si, Fe, Mn, Bal. Cu	Seamless Tube	
57-203-1A		Welding Rod	
57-203-2		Welding Rod	
57-211	Pure Copper	Magnet Wire	B-1-2-3-4-5
57-217A	Brass	Arming Wire	B 134 Grade 4
57-220-A	56% Cu, 18% Ni	Resistance Alloy	
57-226A	99.9% Cu	Anodes	B-1-2-3-4-5
57-227-A	99% Nickel	Anodes	B 160
57-228A	99.9% Zinc	Anodes	B 6 Gr. 3
57-229A	87% Cu, .07 Max. Lead, .05 Max. Iron	Anodes	B 36 Grade 4

U. S. AIR CORPS SPECIFICATIONS

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Spec. No.	Approx. Alloy	Form	Similar to ASTM
10235-A	Aluminum Alloy (24S)	Tubing	
10285-A Cl. A	99.0% Aluminum	Spray Gun Wire	B 24 Gr. 99.0
10285-A Cl. AA	1% Zn Bal. Al	Spray Gun Wire	
10285-A Cl. C	Brass — 66% Cu	Wire	B 36 Gr. 7
10285-A Cl. D	Gilding Metal — 90% Cu	Wire	B 134 Gr. 2
10285-A Cl. F	99.9 Copper	Wire	B 48
10285-A Cl. G	Ni 60%, Cu 23% Min., Fe 3.5, Mn 3.5 Max.	Wire Metal	
10285-A Cl. J	99% Nickel	Wire Metal	B 39 XS
10302	Zinc — Al (4%) — Cu (3%)	Welding Rod	B 86 XXI
10350	Nickel, Copper Aluminum Alloy	Wire	
11066	Al Alloy (24S)	Plate Sheet	
11067	Al Alloy (24S)	Alclad Plate Sheet	
11069	96% Al, 1% Mg, 1% Mn	Al Alloy Tubing	
11070-A	2% Be. Copper	Beryllium Copper	
11074-B	99% Aluminum	2S Foil	B 24 Gr. 99.0%
11076	Aluminum Bronze	Castings	B 30 Cl 9A2 B 148 Cl 9A2
11077	99.0 Aluminum	Corr. Sheet	B 24 Gr. 99.0
11077-Al-1-Alclad	Al Alloy (17S)	Corr. Sheet	B 78
11077-Alclad Al 2	Al Alloy (24S)	Alclad Corr. Sheet	
11077-Al 2	Al Alloy (24S)	Corr. Sheet	
11078-A Gr. 1	Cadmium 10%, Bismuth 50% Lead 29%, Tin 13%	Fusible Alloy	
11078-A Gr. 2	Cadmium 7%, Bismuth 50% Lead 43%	Fusible Alloy	
11079-A Gr. 1	Aluminum-Silicon Alloy	Al Ingot	B 58 Al S1
11079-A Gr. 2	Al, Cu, Si Alloy	Ingots	B 58 Al C1
11084 Gr. 1	Nickel Copper Silicon Alloy	Castings	
11084 Gr. 2	Nickel Copper Silicon Alloy	Castings	
11306 Gr. A	85-5-5-5 Bronze	Castings	B 62
11306 Gr. B	88 Cu, 10 Tin, 2 Zn	Castings	B 30 Cl 1B
11306 Gr. C	83% Cu, 8% Tin, 8% Lead	Castings	B 144 Gr. EA3Y
11306 Gr. D	Copper 72%, Lead 28%	Castings	
11307-A	Al, Si, Cu Alloy	Castings	B 26 Alloy SC 21 B 58 Alloy SC 21
11308-A	Al, Si (7%) Alloy	Castings	
11309-A	Al Magnesium (10%) Alloy	Castings	
11310	Al, Cu Alloy	Castings	B 58 Al CS 21
11311	Aluminum-Silicon Alloy	Castings	B 58 Al S1
11312	Al Cu Si Alloy	Casting Alloy	B 58 Al C2
11317-B Gr. 1	Magnesium — Manganese 1.2 Max.	Sheet	B 90 Al 11

U. S. AIR CORPS SPECIFICATIONS—Continued

Spec. No.	Approx. Alloy	Form	Similar to ASTM
11317-B Gr. 2	Mg — Al (7%) Alloy	Sheets	B 90 Al 8X
11318 Gr. 1	Mg — Al (7%) — Zn (3%) Alloy	Tubing	
11318 Gr. 2	Magnesium — Manganese 1.2 Max.	Rd. Seamless Tube	B 107 Al 11
11319	Magnesium 88% Min. 10% Aluminum	Castings	
11321	Mg — Al (9%) Alloy	Forgings	B 91 Al 9X
11322 Gr. A	Magnesium — Manganese 1.2 Max.	Welding Rod	B 107 Al 11
11322 Gr B	Mg — Al (10%) — Zn (1%)	Sand Castings	B 80 Alloy 14
11324	90% Min. Aluminum	Sand Castings	
11325	Al Base Alloy	Sand Castings	
11326	Al, Mg, Cu Alloy (61S)	Plate Sheet	
11327	Al, Mg, Cu Alloy	Aluminum Tubing	
11328	Zinc — Al (4%) — Cu (3%)	Ingots	B 86 XXI
11329 Ty. A	99% Aluminum	Rivet Wire	B 25
11329 Ty. AD	Al Alloy (A17S)	Rivet Wire	
11329 Ty. D	Al Alloy (17S)	Rivet Wire	B 89 Comp 21
11329 Ty. DD	Al Alloy (24S)	Rivet Wire	
11329 Ty. M	Al, Mg Alloy (56S)	Rivet Wire	
11330	Al, Cu Alloy (11S)	Bars	
11331	88 to 90% cu, 9.5 to 10.5 Tin	Bearings	B 139 Gr. D
11332	Mg — Al (7%) Alloy	Tubing	B 90 Al 8X
11333	Magnesium — Manganese 1.2 Max.	Tubing	B 90 Al 11
11334	Mg — Al (3%) — Zn (3%) Alloy	Tubing	B 107 Al 15X
11335	Mg — Al (7%) Alloy	Bars, Shapes	B 90 Al 8X B 91 Al 8X
11336	Magnesium — Manganese 1.2 Max.	Wrought Alloy	B 107 Al 11
11337	Mg — Al (3%) Zn (3%) Alloy	Wrought Alloy	B 107 Al 15X
11338	Mg — Al (7%) Alloy	Sheets	B 90 Al 8X
11339	Magnesium — Manganese 1.2 Max.	Sheet	B 90 Al 11
11340	Magnesium — Al (3%) Zn (1%)	Sheet	B 90 Al 18X
11342 Gr. A	80% Cu, 15% Silver 5% Phosphorus	Solder	
11342 Gr. B	Silver 50%, Cu, Zn, Cadmium Alloy	Solder	
11345	Mg — Al (7%) Alloy	Forgings	B 91 Al 8X
11346	Magnesium Alloy (3% Al — 5% Tin)	Forgings	B 91 Al 16
11347-(13X)	Al, Si Alloy	Press. Mld. Cstg.	B 108 Gr. 8
11347-(43)	Aluminum — Silicon Alloy	Press. Mld. Cstgs.	B 108 #9A
11347-Alloy 356	Al, Si (7%) Alloy	Per. Mold Cstgs.	
11348	Magnesium, Al (10%) Alloy	Per. Mold Cstgs.	B 80 Alloy 2
11349	Mg — Al (10%) — Zn (2%)	Per. Mold Cstgs.	
11350	Ni 65%, Cu, Al, Mn	Wire	
11351	Al, Zinc (5%) Alloy	Sand Castings	B 26 Al ZG 41

ARMY-NAVY AERONAUTICAL SPECIFICATIONS

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Spec. No.	Approx. Comp.	Form	Similar to ASTM
AN-A-4 (Sec dry)	Al, S., Cu Alloy	Sand Castings	
AN-A-5 (sec dry)	Al, Cu, Si Alloy	Sand Castings	B 26 Gr. SC2
AN-A-9	Aluminum	Plate, Strip	
AN-A-10	Aluminum Coated	Plate, Strip	
AN-A-11	Aluminum	Bar, Rod	
AN-A-12	Al Alloy (24S)	Plate Sheet	
AN-A-13 Alclad	Al Alloy (24S)	Alclad Plate Sheet	
AN-FF-R-551A	99% Aluminum	2S Rivets	B 24 Gr. 99.0
AN-FF-R-551A (17S)	Al Alloy (17S)	Rivets	
AN-FF-R-551A (A17S)	Al Alloy (A17S)	Rivets	
AN-FF-R-551A (24S)	Al Alloy (24S)	Rivets	
AN-FF-R-551A (56S)	Al Alloy (56S)	Rivets	
AN-N-4	Nickel Chrome Iron	Welding Rod	B 166
AN-QQ-A-364	General Spec. for	Aluminum Castings	
AN-QQ-A-366 (13X)	Al, Si, Die Casting Alloy	Die Castings	B 108 #8
AN-QQ-A-366 (85)	Al Alloy (85)	Die Castings	
AN-QQ-A-366 (218)	Al Magnesium (8%) Alloy	Die Casting Alloy	
AN-QQ-A-376	Al, Si, Cu Alloy	Casting Alloy	B 58 Alloy SC21
AN-QQ-A-379	Aluminum Alloy	Casting Alloy	B 58 CN 21 B 112 Al 11
AN-QQ-A 383	Al, Cu, Si Alloy	Per. Mold Castings	B 108 Type 1A
AN-QQ-A-386	Al, Si Alloy	Per Mold	B 108 Gr. #6 B 112 Gr. #6
AN-QQ-A-390	Al, Cu, Si Alloy	Sand Castings	B 26 Gr. C1
AN-QQ-A-392	Al Magnesium (10%) Alloy	Sand Castings	
AA-QQ-A-394	Al, Si (7%) Alloy	Sand Castings	
AN-QQ-A-397	Al, Si, Cu Alloy	Sand Castings	
AN-QQ-A-399	Al, Cu Alloy	Sand Castings	B 58 Al CS21
AN-QQ-A-402	Al Magnesium Alloy	Sand Castings	B 26 Gr. G1
AN-QQ-A-405	Al, Si Alloy	Sand Castings	B 26 Gr. S1
AN-QQ-A-671	99.9% Min. Cadmium	Anodes	
AN-QQ-A-686	99.9% Min. Zn	Anodes	B 6 Gr. 1
AN-QQ-B-646	Naval Brass	Bars, Rods	B 21 Gr. A B 124 Gr. 3
AN-QQ-B-672	Aluminum Bronze	Castings	B 30 Cl 9A2 B 148 Cl 9A2
AN-QQ-M-56 Cl 1A	Mg — Al (6%) — Zn (3%)	Sand Castings	B 80 Alloy 4X
AN-QQ-M-56 Cl B	Mg — Mn (1%)	Sand Castings	B 80 Alloy 11
AN-QQ-M-56 Cl C	Mg — Al (9%) — Zn (2%)	Sand Castings	
AN-QQ-N-268	Nickel Chrome Iron	Rods, Bars	B 166
AN-QQ-N-271A	Nickel Chrome Iron	Sheet, Strip	B 168
AN-QQ-W-298	99% Aluminum	2S Wire	B 24 Gr. 99.0
AN-QQ-W-298 (17S)	Al Alloy (17S)	Rivet Wire	
AN-QQ-W-298 (A17S)	Al Alloy (A17S)	Rivet Wire	
AN-QQ-W-298 (24S)	Al Alloy (24S)	Rivet Wire	
AN-QQ-W-298 (56S)	Al Alloy (56S)	Rivet Wire	
AN-T-13	Mn Al Alloy (3S)	Flex. Tubing	B 79, B 126
AN-T-32	Aluminum	Tubing	
AN-WW-T-831	Nickel Chrome Iron	Round Seamless Tubing	B 167, B 163
AN-WW-T-833	Nickel Chrome Iron	Round Welded Tubing	B 167, B 163

U. S. NAVY SPECIFICATIONS

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Spec. No.	Approx. Comp.	Form	Similar to ASTM
17B12	99.45% Min. Al	Bus Bars	B 24 Gr. 99.5
17E4a	70%, Ni, 23% Cu	Welding Rod	
17W2 (INT) Gr. A	Copper Nickel	Resistance Wire	
17W2 (INT) Gr. B	Copper Nickel	Resistance Wire	
17W2 (INT) Gr. C	Nickel Chromium	Resistance Wire	
17W2 (INT) Gr. D	Nickel Chromium Iron	Resistance Wire	
17W2 (INT) Gr. E	Nickel Chromium	Resistance Wire	
22C3a	Zinc Coated	Non flex Cable	
22C5a	Bronze	Extra Flex Cable	
22C6a	Tinned	Flexible Cable	
22W3c	Copper Wire	Hard Drawn and Rolled	
22W3 (INT)	Copper Wire	Hard Drawn and Rolled	
22W5f	94 Min. Cu, 3½ Tin, ½% Phos.	Phos. Bronze Spring Wire	B 100 Ty. A
22W9a	Copper Wire	Soft or Annealed	
33T3b Ty. 2	97.0% Min. Alum. (3S)	Flex Tube	B 79, B 126 Al M1
33T3b Ty. 3	97.0% Min. Alum. (3S)	Flex Tube	B 79, B 126 Al M1
33T3 Ty. 2	Al, Mg, Cr (52S)	Flex Tubing	B 109
33T3 Ty. 3	Al, Mg, Cr (52S)	Flex Tubing	B 109
41G5 (INT) Gr. A	70% Ni, Copper	Rod, Bars	B 164 Cl. A
41G5 (INT) Gr. B	Ni, Cu, Al Alloy	Bars, Rod	
43R5e Gr. A	99.0% Min. Alum.	Alum. Rivet Wire	B 24 Gr. 99.0
43R5e Gr. B	97.0% Min. Alum. (3S)	Rivet Wire	
43R5e Gr. C	Al, Cu, Mn (17S)	Wire and Rivets	B 89 Al CM 21
43R5e Gr. D	Al, Cu, Mn (24S)	Wire and Rivets	
43R5e Gr. E	Alum. Mg (1%) -- (53S)	Rivet Wire	
43R5e Gr. F	Al, Cu Alloy (A17S)	Rivet Wire	
43R5e Gr. G	Alum. Mg (5%) (56S)	Rivet Wire	
44P2g	99.9% Min. Copper	Seamless Pipe	B 13, B 68, B 75
44P12c Gr. A	85% Cu, Red Brass	Pipe	B 43 Red Brass
44P12c Gr. B	66% Cu, ½% Lead	Brass Seamless Pipe	B 43 Hi-Brass
44T7f	72% Cu, 1% Tin	Ad. Brass Tubing	B 111 Admiral
44T12c	99.9% Min. Copper	Seamless Tube	B 13, B 68, B 75
44T15b Gr. 1	85% Cu, Red Brass	Seamless Tube	B 43 Red Brass
44T15b Gr. 2	66% Cu, ½% Lead	Brass Seamless Tube	B 43 Hi-Brass
44T16a	85% Cu, Red Brass	Seamless Tube	B 111 Red Brass
44T19b	99.0% Min. Alum.	Alum. Seamless Tube	B 24 Gr. 99.0
44T20a	97.0% Min. Alum. (3S)	Tubing	
44T21d	Al, Cu, Mn Alloy (17S)	Rod, Tube	B 89 Al CM 21
44T22a	Al, Cu, Mn Alloy (17S)	Streamline Tube	B 89 Al CM 21
44T23a	5% Si, 2% Zn, Copper	Bronze Seamless Tube	
44T24	96% Min. Al. Mn 1%, Mg 1%	Seamless Tube	
44T28a	Al, Cu, Mg Alloy (24S)	Seamless Tube	
44T30	Alum. Mg (1%) — (53S)	Seamless Tube	
44T32b	Al, Mg, Cr (52S)	Seamless Tube	B 109
44T35 Al 8	Magnesium, 6% Al, 1% Zn	Tubing	B 107 Al 8X
44T35 Al 11	Magnesium, Manganese 1%	Tubing	B 107 Al 11
44T35 Al 15	Magnesium, 3% Al, 3% Zn	Tubing	B 107 Al 15X
44T38	70% Ni, Copper	Seamless and Welded Tube	B 165 B 163 Cu Ni

U. S. NAVY SPECIFICATIONS—Continued

Spec. No	Approx. Comp.	Form	Similar to ASTM
44T39	32% Nickel, 65% Cu	Tubing	B 171 Cu-Ni
44T40	32% Nickel, 66% Cu	Tubing	B 111 (70-30)
45V18 (INT)	55% Nickel, 33 Cu, 12 Tin	Valve Castings	
46A1 (INT) Cl. 1	Alum , Zn 5%, Cu	Sand Castings	B 26 Al ZG 41
46A1 (INT) Cl. 2	Alum Silicon Alloy (SAE35)	Sand Castings	B 26 Al S 1
46A1 (INT) Cl. 2a	Alum , Silicon (5%)	Sand Castings	B 58 Al S 2
46A1 (INT) Cl. 3	Alum , Silicon (7%)	Sand Castings	B 26 Al SG 1
46A1 (INT) Cl. 3a	Alum , Silicon (7%)	Sand Castings	B 26 Al SG 1
46A1 (INT) Cl. 4	Al, Cu 5%, Si 1%	Sand Castings	B 26 Al C 1
46A1 (INT) Cl. 4a	Al, Cu 5%, Si 2%	Sand Castings	B 26 Al C 2
46A1 (INT) Cl. 5	Alum., Magnesium 3%	Sand Castings	B 26 Al G 1
46A1 (INT) Cl. 6	Al, Mg (1%), Cu (2%)	Sand Castings	
46A2c Gr. 1	98% Alum Min	Alum. Ingot	B 24 Gr. 98.0
46A2c Gr. 2	99.0% Min Alum	Alum. Ingots	B 24 Gr. 99.0
46A2c Gr. 3	99.3% Min Alum	Alum. Ingots	B 24 Gr. 99.2
46A2c Gr. 4	99.5% Min. Alum.	Alum. Ingots	B 24 Gr. 99.5
46A2c Gr. 5	99.75% Min Alum	Alum. Ingots	
46A3e	99.0% Min Alum.	Wrought Alum	B 24 Gr. 99.0
46A4g	Al, Cu, Mn Alloy (17S)	Bar and Rod	B 89 Al CM 21
46A5 (INT) Cl. 1	Alum , Zn 5%, Cr	Ingots	B 58 Al ZG 41
46A5 (INT) Cl 2	Alum., Silicon (5%)	Alum. Ingot	B 58 Al S 1
46A5 (INT) Cl 3	Alum., Silicon (7%)	Ingots	B 58 Al SG 1 B 112 Al 10
46A5 (INT) Cl. 4	Al, Cu 4%, Si 2%	Ingots	B 58 Al C 1
46A5 (INT) Cl. 4a	Al, Cu 4%, Si 2%	Ingots	B 58 Al C 2
46A5 (INT) Cl. 5	Alum., Magnesium 3%	Ingots	B 58 Al G 1
46A5 (INT) Cl. 6	Al, Mg (1%), Cu (2%)	Alum. Ingot	
46A6e	97 0% Min. Alum. (3S)	Wrought Alum	B 79, B 126 Al M1
46A7d Gr. 1	Alum Alloy (17S)	Forgings	B 89 Al CM 21
46A7d Gr. 2	Al, Cu, Mn Alloy (25S)	Forgings	
46A7d Gr 3	Al, Si (1%) (SAE 280)	Forgings	
46A7d Gr 5	Alum, Alloy (14S)	Alum. Forgings	
46A7d Gr 6	Al, Cu, Si (12%) (32S)	Forgings	
46A7d Gr. 7	Al, Cu, Ni Alloy (18S)	Forgings	
46A7d Gr 8	Alum. Mg (1%) — (53S)		
46A9d	Alum. Alloy (24S)	Wrought Alum.	
46A10a	Alum. Mg (1%) — (53S)	Wrought Alum	
46A11	Al, Mg, Cr (52S)	Bars, Rods	B 109
46A14 Cl 1	12% Si, Alum. Alloy	Pres. Mld. Cstg	B 85 Al 5
46A14 Cl 2	12% Si, Alum. Alloy	Pres. Mld. Cstg.	B 108 Al 8
46A14 Cl. 3	Alum., Silicon (5%)	Die Castings	B 85 Al 4
46A14 Cl. 4	Al, Si (3%), Cu 7%	Die Castings	B 125 Al 12
46A14 Cl. 5	Al, Si (5%), Cu 4% (SAE 307)	Die Castings	B 125 Al 7
46A14 Cl. 6	Al, 3% Cu, 3% Ni	Die Castings	B 85 Al 9
46A14 Cl 7	Alum., Magnesium 8%	Die Castings	
46A14 Cl 8	Alum., Silicon 7%	Die Castings	
46A15 Cl 1	85.5% Min. Alum., 7% Cu	Perm. Mld. Cstg	B 108 Al 2
46A15 Cl. 2	Alum., Cu 10%	Perm Mld. Cstg	B 112 Al 4
46A15 Cl 3	Alum., Cu 4%, Ni 2%	Perm. Mld Cstg.	B 108 Al 11
46A15 Cl 4	Alum., Cu 5%, Si 3%	Perm. Mld. Cstg.	B 108 Ty. 1A
46A15 Cl 5	Al, 5% Cu, 5% Si	Perm. Mld. Cstg.	B 108 Al 3
46A15 Cl 6	Alum , Cu 1%, Si 5%	Perm. Mld. Cstgs	B 26 Al SC 21
46A15 Cl 7	Alum, Silicon (5%)	Perm. Mld. Cstgs	B 108 Al 9A
46A15 Cl 8	Alum , Silicon 7%	Perm. Mld Cstgs	B 108 Al 10

U. S. NAVY SPECIFICATIONS—Continued

Spec. No.	Approx. Comp.	Form	Similar to ASTM
46A15 Cl. 9	Alum., Si 12%, Ni 2%	Perm. Mld. Cstgs.	B 108 Al 6
46A15 Cl. 10	Alum., Si (12%)	Perm. Mld. Cstgs.	B 108 Al 7
46B5h	88% Cu, 10% Tin, 1% Lead	Bronze Castings	B 143 Al EA2X
46B6	60% Cu, 1% Tin, Bal. Zn	Nav. Brass	B 21 Gr. A
46B6 (INT)	60% Cu, 1% Tin, Bal. Zn	N. Brass Bars, Shapes	B 124 Al 3
46B8g	88% Cu, 6 Tin, 2 Lead	Bronze Castings	B 61, B 143 Cl 2A
46B9d	83% Cu, 4 Zn, 13 Tin	Bronze Castings	
46B10f	63% Cu, 1% Tin, 1% Lead, 1% Mn	Naval Brass	
46B11e	65% Cu, 2½% Lead, 1% Tin	Brass Casting	
46B14e	94% Min. Cu, 3½% Tin, ½% Phos.	Phos. Bronze Shapes	B 100 Ty. A
46B15d Gr. A	Manganese Bronze	Shapes	B 124 Al 4 B 138 Ty. A
46B15d Gr. B	Manganese Bronze	Shapes	B 124 Al 6 B 138 Ty. B
46B16b	Manganese Bronze	Ingots	
46B17b Gr. A	95% Cu, 5% Alum.	Alum. Bronze Shapes	B 124 Al 10
46B17b Gr. B	88% Cu, 8% Al, 4% Iron	Alum. Bronze Shapes	
46B18c	88% Cu, 8% Al, 4% Iron	Alum. Bronze Castings	
46B19a	88% Cu, 8% Al, 4% Iron	Alum. Bronze Ingots	
46B21c	80% Cu, 12 Zn, 7 Tin, 2 Lead	Bronze Casting	
46B22d Gr. 1	75% Cu, 6 Tin, 17 Lead	Bronze Casting	
46B22d Gr. 2	84% Cu, 8% Tin, 8% Lead	Bronze Casting	B 144 Al EA3Y
46B22d Gr. 3	85% Cu, 14 Tin, 1 Zn	Bronze Casting	
46B22d Gr. 4	81% Cu, 19% Tin	Bronze Casting	B 22 Cl. A
46B22d Gr. 5	70% Cu, 5% Tin, 25% Lead	Bronze Casting	B 30 Cl. 3E
46B22d Gr. 6	87% Cu, 5% Tin, 5% Ni	Bronze Castings	
46B23c	85-5-5-5	Bronze Casting	B 62
46B24d	80% Min. Copper	Bronze Casting	
46B26a	60% Cu, 1% Tin, Bal. Zn	Nav. Brass Rods	B 21 Gr. A
46B27	Mn, Si, Bronze	Shapes	
46B28	Mn, Si, Bronze	Castings	
46C3c Gr. A	Phos. plus Copper 99.6% Min.	Ingots (12% Phos.)	
46C3c Gr. B	Phos. plus Copper 99.6% Min.	Ingots (10% Phos.)	
46C5c Gr. A	99.88% Min. Lake or Elec.	Copper Ingot	
46C5c Gr. B	99.75% Min. Refined	Copper Ingot	
46C6a	30% Nickel, Rem Cu	Shapes	B 122 Al 5
46C8	30% Nickel, Rem Cu	Castings	
46M1f	60% Ni, 23% Cu, 3% Iron	Ni-Cu Alloy	
46M2e Gr. 1	92% Tin, 4% Antimony, 4% Cu	Ingots, Castings	B 23 Al 1 B102 Al 1
46M2e Gr. 2	88% Tin, 8% Antimony, 4% Cu	Ingots, Castings	
46M2e Gr. 3	84% Tin, 8% Antimony, 8% Cu	Ingots, Castings	B 23 Al 3
46M2e Gr. 4	81% Tin, 13% Antimony, 5% Cu	Ingots, Castings	B 105 Al 2
46M4e	85% Cu, Red Brass	Castings	
46M6g	88% Cu, 10% Tin, Zn	Bronze Castings	B 143 Cl 1B
46M7 (INT) Cl. a	70% Ni, Copper	Ni-Cu Alloy	B 164 Cl. A
46M7 (INT) Cl. b	70% Ni, Copper	Ni-Cu Alloy	B 164 Cl. B
46M 11	88% Mg, 10% Al	Die Castings	B 91 Al 9X
46M13 Al 8	Magnesium, 6% Al, 1% Zn	Forgings	B 91 Al 8X
46M13 Al 9	Magnesium, 9% Al	Forgings	
46M13 Al 11	Magnesium, Manganese 1%	Forgings	B 107 Al 11
46M13 Al 13	Magnesium, 3% Al, 3% Zn	Forgings	B 91 Al 15X

U. S. NAVY SPECIFICATIONS—Continued

Spec. No.	Approx. Comp.	Form	Similar to ASTM
46M13	Magnesium, 4% Al, 5% Tin	Forgings	B 19 Al 16
46N5a	Ni, Cu, Al Alloy	Ni Alloy	
46N7 (INT) Cl. a	65% Ni, 4% Si, 1% Mn	Ni-Cu Castings	
46N7 (INT) Cl. b	65% Ni, 5% Si, 1% Mn	Ni-Cu Castings	
46R1 (INT) Cl. 1 Ty. A	60% Cu, 40% Zinc	Brass Welding Rod	
46R1 (INT) Cl. 1 Ty. D	99.0% Min. Alum.	Welding Rod	B 24 Gr. 99.0
46R1 (INT) Cl. 1 Ty. E	Alum., Silicon 5%	Welding Rod	
46R1 (INT) Cl. 1 Ty. F	70% Ni, Copper	Welding Rod	B 164 Cl. A
46R1 (INT) Cl. 1 Ty. G	30% Nickel, Rem Cu	Welding Rod	
46R1 (INT) Cl. 2 Ty. B	4 to 11% Tin, Phos. Bronze	Welding Rod	
46R1b Ty. A	60% Cu, 1% Tin, Zn Balance	Brass Welding Rod	
46R1b Ty. B	60% Cu, 1% Tin, Balance Zn	Welding Rod	B 21 Gr. A
46R1b Ty. C	99.75% Min. Cu	Welding Rod	
46R1b Ty. D	99.0% Min. Al	Alum. Weld Rod	B 24 Gr. 99.0
46R1b Ty. E	92.5% Al Min., Si 5%	Welding Rod	
46R6	75% Ni, 15% Chrom, 9% Iron	Welding Rods	B 166
46S3d Gr. A	65% Cu, 18% Ni, Bal. Zn	Ni Silver Shps.	
46S3d Gr. B	65% Cu, 1% Lead, 18% Ni	Ni Silver Shps.	B 151 Al C
46S13 (INT) Gr. 1	45% Silver, 30% Cu, 25% Zn	Brazing Alloy	
46S13 (INT) Gr. 2	65% Silver, 20% Cu, 15% Zn	Brazing Alloy	
46S13 (INT) Gr. 4	50% Silver, 15% Cu, 15% Zn, 19% Cadmium	Brazing Alloy	
46S13 (INT) Gr. 5	50% Silver, 15% Cu, 16% Zn, 16% Cadmium, 3% Ni	Brazing Alloy	
46S14a Gr. A	50.6% Lead, 49% Tin	Wire Solder	
46S14a Gr. B	56% Lead, 44% Tin	Solder	
46S14a Gr. C	62% Lead, 38% Tin	Solder	
46S14a Gr. D	64% Lead, 35% Tin, 1% Antimony	Solder	
46S14a Gr. E	68% Lead, 30% Tin Min.	Solder	
46S14a Gr. F	30% Lead, 70% Tin	Solder	
46S15a Gr. A	50% Cu, 50% Zn	Brazing Solder	
46S15a Gr. B	50% Cu, 4% Tin	Brazing Solder	
46S15a Gr. C	70% Copper, Zn	Brazing Solder	
46S15a Gr. D	80% Copper, Zn	Brazing Solder	B 134 Al 4
46S20 (INT) Gr. A	48% Min. Lead, 48% Min. Tin	Wire Solder (Flux Core)	
46S20 (INT) Gr. B	60% Lead, 40% Tin	Solder Wire	
46S20 (INT) Gr. C	57% Min. Lead, 37% Min. Tin	Wire Solder (Flux Core)	
46S38 (INT)	94% Tin, 6% Antimony	Solder	
46S42	94.9% Min. Lead, 5% Silver	Lead Silver Solder	
46T1d Gr. A	99.75% Min. Tin	Tin Pig	
46T1d Gr. B	98.0% Min. Tin	Tin Pig	
46Z1a Gr. A	Pure Zinc	Slab Zinc	B 6 Gr. 1
46Z1a Gr. B	Zinc	Slabs	B 6 Gr. 2
46Z1a Gr. C	Zinc	Slabs	B 6 Gr. 3

U. S. NAVY SPECIFICATIONS—Continued

Spec. No.	Approx. Comp.	Form	Similar to ASTM
46Z1a Gr. D	Zinc (8% Max. Lead)	Slabs	B 6 Gr. 4
46Z1a Gr. E	Zinc (1% Max. Lead)	Slabs	B 6 Gr. 5
46Z2 (INT) Cl. A	Zinc, 4% Alum.	Die Castings	B 86 XXIII
46Z2 (INT) Cl. B	Zinc, 4% Alum. 1% Cu	Die Castings	B 86 XXV
46Z2a Cl. A	Zinc, 4% Alum.	Die Castings	B 186 XXXIII
46Z2a Cl. B	Zinc, 4% Alum., 1% Cu	Die Castings	B 186 XXXV
47A2d	99.0% Min. Al	Sheet, Strip Al	B 24 Gr. 99.0
47A3c	Al, Cu, Mn Alloy (17S)	Plate, Sheet	B 78
47A4e	97% Min. Alum. (3S)	Plate, Sheet	B 79; B 126 Al M1
47A5b Gr. A	99.0% Min. Al	Alum. Foil	B 24 Gr. 99.0
47A5b Gr. B	Special	Alum. Foil	
47A6b	Al, Cu, Mn Alloy (17S)	Sheet	B78
47A7	97.0% Min. Alum. (3S)	Plate	
47A8a	Alum. Alloy (24S)	Sheet	
47A10d	Alum. Alloy (24S)	Sheet, Strip	
47A11b	Al, Mg, Cr (52S)	Sheet, Strip	B 109
4712a	Alum. Mg (1%) — (53S)	Plate, Sheet	
47B2 (INT)	65% Cu, 3% Lead, 1½% Tin, Max.	Brass Shapes	
47B3	72% Cu, 1% Tin	Ad. Brass Plates	B 171 Admiral
47C2f	99.9% Min. Copper	Cu Shapes	B 149, B 133
47L1b Gr. A	99.9% Min.	Lead Sheet	B 29 Acid
47L1b Gr. B	99.5% Min.	Lead Sheet	B 29 Comm. A
47M2a Al 8	Magnesium, 6% Al, 1% Zn	Sheet	B 90 Al 8X
47M2a Al 11	Magnesium, Manganese 1%	Sheet	B 90 Al 11
47M2a Al 18	Magnesium, 3% Al, 1% Zn	Sheet	B 90 Al 18X
47N1a	75% Ni, 15% Chrom. 9% Iron	Ni Cr Alloy	
47Z6b	Rolled Zinc	Plate, Sheet	
49B3e	Manganese Bronze	Castings	
49T13	75% Ni, 15% Chrom., 9% Iron	Rd. Seamless Tube	B 167
49T14	75% Ni, 15% Chrom., 9% Iron	Rd. Welded Tube	B 163 Ni-Cr.
51M1	Prime Virgin	Mercury	
52Z3d	Zinc 88 to 95%	Zinc Dust	
O.S. 443	87% Cu, 10% Al, 3% Iron	Aluminum Bronze	
O.S. 550	Manganese Bronze	Castings	B 30 Ty. 8B B 147 Ty. 8B
O.S. 768	Silicon Bronze	Sheet, Strip	
O.S. 769	Silicon Bronze	Sheet, Plate	
O.S. 770	Silicon Bronze	Bars, Rods	B 124 Al 9
O.S. 808	60% Cu, 1% Tin, Bal. Zn	Brass Die Castings	
O.S. 817	63% Cu, 1% Lead	Brass Rod, Bar	
O.S. 822	5% Tin, 10% Antimony, Bal. Lead	Wire	B 23 Al 9
O.S. 839	Alum. 89%, Cu 5%, Si 3%	Perm. Mld. Cstg.	B 108 Ty. 1A
O.S. 840	62% Cu, 2% Lead	Comm. Brass	B 121 Al 4
O.S. 883	70% Ni, Copper	Seamless Tube	B 165 B163 Ni-Cu
O.S. 889	99.9% Min. Copper	Seamless Tube	B 13, B 68, B 75
O.S. 1331	70% Copper, Zn	Brass Sheet, Strip	B 19
O.S. 1359 Gr. 1	85-5-5-5	Bronze Casting	B 30 Ty. 4A
O.S. 1359 Gr. 2	80% Cu, 3% Tin	Bronze Casting	
O.S. 1359 Gr. 3	88% Cu, 10% Tin, 1% Lead	Bronze Castings	B 143 Al EA2X B 130 Al EA2X
O.S. 1373	Silicon Bronze	Casting Alloy	

FEDERAL SPECIFICATIONS

These specifications show only generalized description of the products by types, and do not cover details of chemical composition, physical requirements, electrical requirements, or tolerances. The specification should be referred to for this information. The comparative specifications shown are approximate in all cases, as there may be differences in chemistry, physical and other requirements.

Spec. No.	Approx. Comp.	Form	Similar to ASTM
QQ-A-315	Al, Mg (2%) Alloy (52S)	Bars, Shapes	B 109
QQ-A-318	Al, Mg (2%) Alloy (52S)	Plate, Sheet	B 109
QQ-A-327	Al, Mg (1%) Alloy (61S)	Plate, Sheet	
QQ-A-331B	Al, Mg (2%) Alloy (53S)	Bars, Shapes	
QQ-A-334	Al, Mg (2%) Alloy (53S)	Plate, Sheet	
QQ-A-351a	Al, Cu Alloy (17S)	Bars, Shapes	B 89 Al 21
QQ-A-353a	Al, Cu Alloy (17S)	Plate, Sheet	B 78
QQ-A-354	Al Alloy (24S)	Bars, Shapes	
QQ-A-355a	Al Alloy (24S)	Plates, Sheets	
QQ-A-356b	Al, Manganese (3S)	Bars, Shapes	B 79, B 126 Al M1
QQ-A-359a	Al, Manganese (3S)	Plate, Sheet	B 79, B 126 Al M1
QQ-A-361	Al, Cu Alloy (17S)	Sheet	B 78
QQ-A-362	Al Alloy (24S)	Alclad Sheet	
QQ-A-367b Gr. 1	Al, Cu Alloy (17S)	Forgings	B 78
QQ-A-367b Gr. 2	Al Alloy (25S)	Forgings	
QQ-A-367b Gr. 3	1% Si, Al Alloy	Forgings	
QQ-A-367b Gr. 5	1% Si, 1% Mn, 5% Cu	Aluminum Forging	
QQ-A-367b Gr. 6	12% Si, Mang — Ni (32S)	Aluminum Forgings	
QQ-A-367b Gr. 7	Al, Cu (4%), Ni (2%)	Forgings	
QQ-A-367b Gr. 8	Al, Mg (2%) Alloy (53S)	Forgings	
QQ-A-371a Cl. 1	Al, Manganese (1%), Cu (1%)	Ingots	
QQ-A-371a Cl. 2	5% Si Al Alloy	Ingots	B 112 Al 9A
QQ-A-371a Cl. 3	Al, Si (7%)	Ingots	B 58 Al SG1
QQ-A-371a Cl. 4	Al, Cu (5%)	Aluminum Ingot	B 58 Al C1
QQ-A-371a Cl. 5	Al, Magnesium (4%)	Ingots	B 58 Al G1
QQ-A-371a Cl. 6	Al, Ni (2%)	Ingots	B 58 Al CN21 B 112 Al 11
QQ-A-371a Cl. 7	Al, Cu (10%)	Ingots	B 58 Al CG1
QQ-A-371a Cl. 8	Al, Cu (4%) Si (3%)	Ingots	
QQ-A-371a Cl. 9	Al, Cu (8%) Si (1%)	Ingots	
QQ-A-371a Cl. 10	Al, Si (5%), Cu (1%)	Ingots	B 58 Al SC21
QQ-A-371a Cl. 11	Al, Si (5%), Cu, Mn, Ni	Ingots	
QQ-A-371a Cl. 12	Al, Si (12%)	Aluminum Ingot	B 112 Al 6
QQ-A-411b	99% Min. Al	Bars and Shapes	B 25
QQ-A-451a Cl. 1	98.0% Min. Al	Aluminum Ingot	B 24 Gr. 98.0
QQ-A-451a Cl. 2	99% Min. Al	Ingots	B 24 Gr. 99.0
QQ-A-451a Cl. 3	99.3% Min. Al	Ingots	B 24 Gr. 99.2
QQ-A-451a Cl. 4	99.5% Min. Al	Aluminum Ingot	B 24 Gr. 99.5
QQ-A-451a Cl. 5	99.75% Min. Al	Aluminum Ingot	
QQ-A-561	99.0% Min. Al	Plate, Sheet	B 25
QQ-A-591 Cl. 1	Al, Si Alloy	Pressure Mld. Cstg.	B 24 Al #5
QQ-A-591 Cl. 2	Al, Si (12%) Alloy	Pressure Mld. Cstg.	
QQ-A-591 Cl. 3	5% Si Al Alloy	Die Castings	B 85 Al 4
QQ-A-591 Cl. 4	Al, Cu, Si Alloy	Die Casting	B 125 Al 12

FEDERAL SPECIFICATIONS—Continued

Spec. No	Approx Comp	Form	Similar to ASTM
QQ-A-591 Cl. 5	Al, Cu, Si Alloy	Die Casting	B 85 Al 7A
QQ-A-591 Cl. 6	Al, Cu, Si Alloy	Die Casting	B 85 Al 9
QQ-A-591 Cl. 7	Al, Magnesium (8%)	Die Castings	
QQ-A-591 Cl. 8	5% Si, Al Alloy	Die Castings	B 108 Al 9A
QQ-A-591 Cl. 9	Al, Magnesium (3½%)	Die Castings	
QQ-A-596 Cl. 1	Al, Cu (7%)	Perm. Mld. Cstg.	B 108 Cl 2
QQ-A-596 Cl. 2	Al, Cu (10%)	Perm. Mld. Cstg.	B 108 Al 4
QQ-A-596 Cl. 3	Al, Cu, Ni	Perm. Mld. Cstg.	B 108 Al 11
QQ-A-596 Cl. 4	Al, Cu (5%) Si (3%)	Perm. Mld. Cstg.	B 108 Ty 1A
QQ-A-596 Cl. 5	Al, Cu (5%) Si (5%)	Perm. Mld. Cstg.	B 108 Cl 3
QQ-A-596 Cl. 6	Al, Si (5%) Cu (1%)	Perm. Mld. Cstg.	B 26 Al SC21
QQ-A-596 Cl. 7	5% Si, Al Alloy	Perm. Mld. Cstg.	B 108 Al 9A
QQ-A-596 Cl. 8	Al, Si (7%)	Perm. Mld. Cstg.	B 108 Cl 10
QQ-A-596 Cl. 9	Al, Si (12%)	Perm. Mld. Cstg.	B 108 Al 6
QQ-A-596 Cl. 10	12% Si, Al Alloy	Perm. Mld. Cstg.	B 108 Al 7
QQ-A-601 Cl. 1	Al, Manganese (1%), Cu (1½%)	Castings	
QQ-A-601 Cl. 2	5% Si Al Alloy	Castings	B 26 Al S1
QQ-A-601 Cl. 3	Al Si (7%)	Castings	B 26 Al SG1
QQ-A-601 Cl. 4	Al Alloy (25S)	Castings	
QQ-A-601 Cl. 5	Al, Magnesium (4%)	Castings	B 26 Al G1
QQ-A-601 Cl. 6	Al, Cu, Ni	Castings	B 26 Al CN 21
QQ-A-601 Cl. 7	Al, Cu (10%)	Castings	B 26 Al CG1
QQ-A-601 Cl. 8	Al, Cu (4%) Si (3%)	Castings	
QQ-A-601 Cl. 9	Al, Cu (8%) Si (1%)	Castings	B 58 Al CS 21
QQ-A-601 Cl. 10	Al, Si (5%) Cu (10%)	Castings	B 26 Al SC 21
QQ-A-601 Cl. 11	Al, Si (5%) Cu, Mn, Ni	Castings	
QQ-A-601 Cl. 12	Al, Si (12%)	Castings	B 108 Al 6
QQ-B-601 Gr. A	83 to 86% Copper	Red Brass Casting	
QQ-B-601 Gr. B	83 to 86% Copper	Red Brass Casting	
QQ-B-611a Gr. A	Leaded Brass	Brass Forgings	B 124 Al 2
QQ-B-611a Gr. B	62% Cu, 3 Lead, Bal. Zn	Comm. Brass	B 16
QQ-B-611a Gr. C	66% Cu, 33% Zn	Brass Shapes	B 36 Al 8
QQ-B-611a Gr. D	Leaded Brass	Shapes, Bars	B 121 Al 6
QQ-B-611a Gr. E	70% Cu, 30% Zn	Brass Shapes	B 19, B 36 Al 6
QQ-B-621 Gr. A	60% Cu, Naval Brass	Naval Brass Casting	B 30 Gr. C plus Mn
QQ-B-621 Gr. B	Leaded Brass	Comm. Brass Casting	B 121 Al 6
QQ-B-636	60% Cu, Naval Brass	Various	B 171 Naval Brass
QQ-B-666 Gr. A	Al, Bronze	Shapes	B 124 Al 10
QQ-B-666 Gr. B-1	Al, Mng. Bronze	Bars, Shapes	B 150 Type 1 B 124 Al 11-1
QQ-B-666 Gr. B-2	Al, Mng. Bronze	Bars, Shapes	B 150 Type 2 B 124 Al 11-2
QQ-B-671a Cl. A	Min. 78% Cu, Al, Mn	Al Bronze Casting	
QQ-B-671a Cl. B	Min. 88% Cu, 10 Al	Al Bronze Casting	B 30 Gr. 9B B 148 Gr. 9B
QQ-B-671a Cl. C	Min. 78% Cu, Al, Mn	Al Bronze Casting	
QQ-B-671a Cl. D	Min. 78% Cu, Al, Mn	Al Bronze Casting	
QQ-B-691a Cl. 1	88% Cu, 6 Tin, 1½ Lead	Bronze Casting	B 61 B 143 Cl 2A
QQ-B-691a Cl. 2	85-5-5-5	Bronze Casting	B 62, B 145 Ty 4A

FEDERAL SPECIFICATIONS—Continued

Spec. No.	Approx. Comp.	Form	Similar to ASTM
QQ-B-691a Cl. 3	80% Cu, 10 Zn, 5 Tin, 3 Lead	Bronze Castings	
QQ-B-691a Cl. 4	85% Cu, 3% Tin	Bronze Castings	
QQ-B-691a Cl. 5	88% Cu, 10% Tin	Bronze Casting	B 143 Cl 1B
QQ-B-691a Cl. 6	87% Cu, 8% Tin, 1% Lead	Bronze Casting	B 60 EA2X B 143 EA2X
QQ-B-691a Cl. 6X	87% Cu, 8% Tin, 1% Lead	Bronze Casting	B 60 EA2X B 143 EA2X
QQ-B-691a Cl. 7	77% Cu, 6% Tin, 17% Lead	Bronze Casting	B 66 Med. Bronze
QQ-B-691a Cl. 8	84% Cu, 8 Tin, 8 Lead	Bronze Casting	B 144 Al EA3Y
QQ-B-691a Cl. 9	85% Cu, 14% Tin	Bronze Casting	
QQ-B-691a Cl. 10	81% Cu, 19% Tin	Bronze Casting	B 22 Cl. A
QQ-B-691a Cl. 11	80% Cu, 3 Tin, 7 Lead	Bronze Casting	B 30 Cl 5A
QQ-B-691a Cl. 12	83% Cu, 7% Tin, 7% Lead	Bronze Casting	B 144 Al 3B
QQ-B-701 Gr. 1	88% Cu, 6% Tin, 1½% Lead	Bronze Ingot	B 30 Cl 2A
QQ-B-701 Gr. 2	85-5-5-5	Bronze Ingots	B 30 Ty. 4A
QQ-B-701 Gr. 3	80% Cu, 10% Zn, 5% Tin, 3% Lead	Bronze Ingots	
QQ-B-701 Gr. 4	85% Cu, 3% Tin, 6% Lead	Bronze Castings	
QQ-B-701 Gr. 5	88% Cu, 10% Tin	Bronze Ingots	B 30 Gr. EA2Y
QQ-B-701 Gr. 6	87% Cu, 8% Tin, 1% Lead	Bronze Ingots	B 30 Gr. 2B B 30 Gr. EA2X
QQ-B-701 Gr. 7	77% Cu, 6% Tin, 17% Lead	Bronze Casting	B 66 Med. Bronze
QQ-B-701 Gr. 8	84% Cu, 8% Tin, 8% Lead	Bronze Ingot	B 30 Al EA3Y
QQ-B-701 Gr. 9	85% Cu, 14% Tin	Bronze Casting	
QQ-B-701 Gr. 10	81% Cu, 19% Tin	Bronze Alloy	B 22 Cl A
QQ-B-721a Gr. A	Manganese Bronze	Various	B 124 Al 4 B 138 Type A
QQ-B-721a Gr. B	Manganese Bronze	Mn Bronze Castings	B 30 Type 8B B 147 Type 8B
QQ-B-726b Gr. A	Manganese Bronze	Castings	
QQ-B-726b Gr. B	Manganese Bronze	Mn Bronze Castings	B 30 Type 8B B 147 Type 8B
QQ-B-726b Gr. C	Manganese Bronze	Mn Bronze Castings	B 30 Type 8B B 147 Type 8B
QQ-B-726b Gr. D	Manganese Bronze	Casting Alloy	B 132 Cl A
QQ-B-731a	Manganese Bronze	Ingots	
QQ-B-746 Gr. A	Min. 94% Cu, 3.5% Tin	Phos. Bronze	B 100 Type A
QQ-B-746 Gr. B	Min. 89% Cu, 9% Tin	Phos. Bronze	B 103 Gr. D B 139 Gr. D B 159 Gr. D
QQ-C-501a	99.9% Min. Copper	Shapes	B 133
QQ-C-521a Gr. A	99.9% Min. Copper	Ingots	B 4, B 5
QQ-C-521a Gr. B	99.5% Min. Copper	Ingots	
QQ-C-551	60% Min. Nickel, Cu Alloy	Castings	
QQ-C-571 Gr. A	14% Phos., Cu	Phos. Copper Alloy	P + Cu — 99.6%
QQ-C-571 Gr. B	10% Phos., Cu	Phos. Copper Alloy	P + Cu — 99.6%
QQ-C-581	Cu, Si (11%) Alloy	Various	
QQ-C-591a Gr. A	Cu, Si, Tin Zinc	Copper Silicon Shapes	B 124 Al 9

FEDERAL SPECIFICATIONS—Continued

Spec. No.	Approx. Comp.	Form	Similar to ASTM
QQ-C-591a Gr. B	Cu, Si, Tin	Copper Silicon Shapes	B 124 Al 8
QQ-C-591a Gr. D	Cu, Si, Tin, Zn	Copper Silicon Shapes	B 124 Al 9
QQ-C-593	Cu, Si Alloy	Copper Silicon Cstg.	B 124 Al 9
QQ-L-156	99.7% Min. Lead	Caulking Lead	B 29 Com. B
QQ-L-171 Gr. A	99.9% Min. Lead	Lead Pig	B 29 Acid
QQ-L-171 Gr. B	95.0% Min. Lead	Lead Pig	
QQ-L-201 Gr. A	99.9% Min. Lead	Lead Sheet	B 29 Acid
QQ-L-201 Gr. B	99.5% Min. Lead	Lead Sheet	B 29 Com. B
QQ-M-161 Gr. 1	92% Tin, 5% Antimony	Bearing Metal	B 23 Al 1
QQ-M-161 Gr. 2	88% Tin, 7% Antimony	Bearing Metal	
QQ-M-161 Gr. 3	84% Tin, 8% Antimony	Bearing Metal	B 23 Al 3
QQ-M-161 Gr. 4	81% Tin, 13% Antimony	Bearing Metal	B 102 Al 2
QQ-M-161 Gr. 6	80% Lead, 15% Antimony	Bearing Metal	B 23 Al 8
QQ-M-161 Gr. 7	75% Lead, 15% Antimony, 10% Tin	Bearing Metal	B 23 Al 7
QQ-N-281 Cl. A	65% Nickel, Cu Alloy	Various	B 127, B 163, B 164A, B 165
QQ-N-281 Cl. B	65% Nickel, Cu Alloy	Various	B 164-B
QQ-N-286	Nickel Copper Aluminum	Various	
QQ-N-301 Gr. A	99.5% Min. Nickel	Cathodes	B 39 EL
QQ-N-301 Gr. B	98.9% Min. Nickel	Remelt	B 39 XS
QQ-N-301 Gr. C	97.75% Min. Nickel	Remelt	B 39 AS
QQ-N-321 Gr. A	18% Ni, 65% Cu, Zn	Nickel Silver Shapes	
QQ-N-321 Gr. B	18% Ni, 65% Cu, Lead	Nickel Silver Shapes	
QQ-R-571 Ty. A	60% Cu, Naval Brass	Welding Rod	
QQ-R-571 Ty. B	60% Cu, Naval Brass	Welding Rod	B 21 Gr. A
QQ-R-571 Ty. C	99.75% Min. Copper	Welding Rod (.10% Min. S or .05% Phos.)	
QQ-R-571 Ty. D	99.0% Min. Alum.	Welding Rod	B 24 Gr. 99.0
QQ-R-571 Ty. E	5% Si, Al Alloy	Welding Rod	B 58 Al S1
QQ-R-571 Ty. F	60% Min. Nickel, Cu Alloy	Welding Rod	
QQ-S-551 Gr. A	50% Cu, 50% Zn	Brazing Solder	
QQ-S-551 Gr. B	50% Cu, 4% Tin, Bal. Zn	Brazing Solder	
QQ-S-551 Gr. C	70% Cu, 30% Zn	Brazing Solder	B 134 Al 6
QQ-S-551 Gr. D	80% Cu, 20% Zn	Brazing Solder	B 134 Al 4
QQ-S-561c Cl. 1	45% Silver	Solder	
QQ-S-561c Cl. 2	65% Silver	Solder	
QQ-S-561c Cl. O	Cu 46%, 35 Zn, 20% Ag	Silver Solder	
QQ-S-571a Cl. A	50% Tin, 50% Lead	Solder	
QQ-S-571a Cl. B	40% Tin, 60% Lead	Solder	
QQ-S-571a Cl. D	35% Tin, 1% Antimony	Solder	
QQ-S-571a Cl. E	30% Tin, 70% Lead	Solder	
QQ-S-571a Cl. F	70% Tin	Solder	
QQ-S-571a Cl. G	20% Tin	Solder	
QQ-S-571a Cl. H	60% Tin	Solder	B 32 Gr. A
QQ-T-351	96% Min. Tin, 3.5% Phos.	Phos. Tin Ingot	B 51
QQ-T-371 Gr. A	99.75% Min. Tin	Tin Pig	

FEDERAL SPECIFICATIONS—Continued

Spec. No.	Approx. Alloy	Form	Similar to ASTM
QQ-T-371 Gr. B	98% Min. Tin	Tin Pig	
QQ-W-321 Gr. A	67% Cu, 33% Zn	Brass Wire	B 134 Al 7
QQ-W-321 Gr. B	67% Cu, 33% Zn	Brass Wire	B 134 Al 7
QQ-W-321 Gr. C	70% Cu, 30% Zn	Brass Wire	B 134 Al 6
QQ-W-336	Copper	Trolley Wire	
QQ-W-341	Copper	Annealed Wire	
QQ-W-401	Min. 94% Cu, 3.5% Tin	Spring Wire	B 100 Type A
QQ-Z-351a Gr.Al	Pure Zinc	Slab High Grade	B 6 Gr. 1A
QQ-Z-351a Gr. A	Pure Zinc	Slab High Grade	B 6 Gr. 1
QQ-Z-351a Gr. B	Intermediate Grade	Zinc Slab	B 6 Gr. 2
QQ-Z-351a Gr. C	Brass Special	Zinc Slab	B 6 Gr. 3
QQ-Z-351a Gr. D	Selected	Zinc Slab	B 6 Gr. 4
QQ-Z-351a Gr. E	Prime Western	Zinc Slab	B 6 Gr. 5
TT-A-468	Aluminum Powder	Paste and Paint	
E-QQ-B-621, Al X	Leaded Brass	Casting Alloy	B 146, EA Al 6X B 30 EA Al 6X Ingot
E-QQ-B-621, Al Y	Leaded Brass	Casting Alloy	B 146, EA Al 6Y B 146 EA Al 6Y Ingot
E-QQ-B-691a Cl. 2	80% Cu, 9% Zn, 3% Tin, 7% Lead	Bronze Casting	
E-QQ-B-691a Cl. 3	80% Cu, 9% Zn, 3% Tin, 7% Lead	Bronze Casting	
E-QQ-B-691a Cl. 5	87% Cu, 8% Tin, 1% Lead	Bronze Alloy	B 60 EA2X B 143 EA2X
WW-P-351 Gr. A	85% Cu, Red Brass	Seamless Pipe	B 43 Red Brass
WW-P-351 Gr. B	67% Cu, 33% Zn	Seamless Pipe	B 43 High Brass
WW-P-351 Gr. C	65% Cu, 35% Zn	Seamless Pipe	B 134 Al 8
WW-P-377	Copper	Seamless Pipe	
WW-P-448a Comp. 1	88% Cu, 6% Tin, 1½% Lead	Bronze Pipe Fittings	B 30 Cl. 2A
WW-P-448a Comp. 2	85-5-5-5	Bronze Pipe Fittings	B 62
WW-P-448a Comp. 2W	85% Cu, 2% Lead, Bal. Zn	Pipe Fittings	
WW-P-541a	65% Nickel, Cu Alloy	Fixtures	B 127, B 163, B 164A, B 165
WW-T-756	70% Cu, 1% Tin, Bal. Zn	Tubing	B 111 Adm.
WW-T-783	99% Min. Al (2S)	Tubing	B 24 Gr. 99.0
WW-T-786a	Al, Cu Alloy (17S)	Tubing	B 78
WW-T-787	Al, Mg (2%) Alloy (52S)	Seamless Tube	B 109
WW-T-788	Al, Manganese (3S)	Seamless Tube	B 79, B 126 Al M1
WW-T-789	Al. Mg (1%) Alloy (61S)	Seam ess Tube	
WW-T-790	Al, Mg (2%) Alloy (53S)	Seamless Tube	
WW-T-791 Gr. 1	85% Cu, Red Brass	Seamless Tube	B 135 Al 1
WW-T-791 Gr. 2	67% Cu, 33% Zn	Seamless Tubing	B 43 High Brass
WW-T-791 Gr. 3	65% Cu, 35% Zn	Seamless Tubing	B 134 Al 8
WW-T-797	99.5% Min. Copper	Seamless Tube	B 13, B 68 Type D B 75 Type D
WW-T-799	99.5% Min. Copper	Seamless Tube	B 13, B 68 Type D B 75 Type D

SOCIETY OF AUTOMOTIVE ENGINEERS SPECIFICATIONS

These specifications show only generalized description of the products by types, and do not cover details of chemical composition, physical requirements, electrical requirements, or tolerances. The specification should be referred to for this information. The comparative specifications shown are approximate in all cases, as there may be differences in chemistry, physical and other requirements.

Spec. No.	Approx. Alloy	Form	Similar to ASTM
SAE 1 Cl. A	50% Tin, 50% Lead	Solder	
SAE 1 Cl. B	49½% Tin, 50% Lead, ½% Antimony	Solder	
SAE 2 Cl. A	45% Tin, 55% Lead	Solder	
SAE 2 Cl. B	43% Tin, 55% Lead, 1% Antimony	Solder	
SAE 3 Cl. A	40% Tin, 60% Lead	Solder	
SAE 3 Cl. B	60% Lead, 2% Antimony, 83% Tin	Solder	B 32 Ty. A B 32 Ty. B
SAE 4 Cl. A	25% Tin, Bal. Lead	Solder	
SAE 4 Cl. B	23% Tin, 2% Antimony, Bal. Lead	Solder	
SAE 5A	20% Tin, Bal. Lead	Solder	
SAE 5B	20% Tin, 1½% Antimony, Bal. Lead	Solder	
SAE 6A	15% Tin, Bal. Lead	Solder	
SAE 6B	15% Tin, 2% Antimony, Bal. Lead	Solder	
SAE 10	90% Tin, 5% Cu, 5% Antimony	Ingots, Bearings	B 23 Al 1
SAE 11	87% Tin, 6% Cu, 7% Antimony	Ingots, Bearings	
SAE 13	85% Lead, 10% Antimony, 5% Tin	Ingots, Bearings	B 23 Al 9
SAE 14	76% Lead, 14% Antimony, 10% Tin	Ingots, Babbitt	B 23 Al 7
SAE 15	15% Antimony, 1% Arsenic, 1% Tin, Bal. Lead	Ingots, Bearings	B 23A EA Al 15
SAE 17 Cast	98.5% Min. Silver	Bearing Alloy	
SAE 17 Plated	99.5% Min. Silver	Bearing Alloy	
SAE 17 Rolled	99.75% Min. Silver	Bearing Alloy	
SAE 18	Cadmium 98.5% Min., Ni 1%	Bearings	
SAE 24	Alum., 1½% Mg, 4% Cu (24S)	Wrought Alum.	
SAE 25	99.0% Min. Alum.	Wrought Alum.	B 24 Al 99.0
SAE 26	95% Al, 4% Cu, 1% Mang. (17S)	Wrought Alum.	B 78, B 89 Al CM 21
SAE 27	Alum., 5% Cu, 1% Si, 1% Mang. (25S)	Wrought Alum.	
SAE 29	97% Min. Al, 1% Mang. (3S)	Wrought Alum.	B 79, B 126 Al M1
SAE 30	Alum., 8% Cu	Castings	
SAE 31	Alum., Zn 10%, Cu 3%	Sand Castings	
SAE 32	Alum., 12% Cu	Sand Castings	
SAE 33	Alum., 8% Cu, 2% Si	Sand Castings	B 26 CS 22
SAE 34	Alum., 10% Cu	Sand Castings	B 26 Al CG 1
SAE 35	Alum., 5% Si	Sand Castings	B 26 Al S 2
SAE 36	Alum., 8% Cu, 2% Si	Sand Castings	B 26 CS 21
SAE 37	Alum., 12% Si	Sand Castings	B 26 Al S 3
SAE 38	Alum., 5% Cu, 1% Si	Sand Castings	B 26 Al C1
SAE 39	Alum, 1% Mg, 4% Cu, 2% Ni	Sand Castings	B 26 Al CN 21

SOCIETY OF AUTOMOTIVE ENGINEERS SPECIFICATIONS—Continued

Spec. No.	Approx. Alloy	Form	Similar to ASTM
SAE 40	85-5-5-5	Castings	B 30 Ty. 4A
SAE 41	65% Cu, 3% Lead	Brass Castings	
SAE 42	60% Cu, 18% Ni, Bal. Zn	Ni Brass Castings	
SAE 43	58% Cu, 1% Lead, Bal. Zn	Mang. Brz. Castings	B 30 Cl. 8A, B 147 Gr. 8A
SAE 44	85% Cu, Bal Zinc	Cast Brass	
SAE 45	50 to 53% Cu, Bal Zn	Brazing Solder	
SAE 48	70% Cu, 30% Lead	Bearings	
SAE 50	Magnesium, Al 6%, Zn 3%	Sand Castings	B 80 A 4 or 4X
SAE 51	Magnesium, Mang. 1%	Sheet Strip	B 90 A 11
SAE 52	Magnesium, Al 3%, Zn 1%	Wrought	B 91 Al 18X
SAE 53	Magnesium, Al 12%	Forgings	B 91 A 16
SAE 62	88% Cu 2% Zn, 10% Tin	Bronze Castings	B 30 C 1A
SAE 63 Gun Metal	88% Cu 10% Tin 2% Lead	Castings	
SAE 64	80% Cu, 10% Tin, 10% Lead	Phos. Bronze	B 66 Phos. Bronze
SAE 65	90% Cu, 10% Tin, Phos. .25%	Phos. Bronze Castings	
SAE 66	85% Cu, 5% Tin, 9% Lead, 1% Zn	Bearing Backs	B 144 Gr. C
SAE 67	78% Cu, 6% Tin, 15% Lead, 3% Zn	Bronze Castings	
SAE 68 Gr. A	88% Cu, 9% Alum., 3% Fe	Alum. Bronze Castings	B 30 Cl. 9A1 B 148 Cl. 9A-A1
SAE 68 Gr. B	87% Cu, 11% Al, 2% Fe	Alum. Bronze Castings	
SAE 70 Gr. A	70% Cu, Bal. Zinc	Brass Sheet	B 36 Al 6, B 19
SAE 70 Gr. B	67% Cu, Bal. Zinc	Brass Sheet	B 36 Al 7
SAE 70 Gr. C	65% Cu, Bal. Zinc	Brass Sheet	B 36 Al 8
SAE 71	99.9% Min. Alum.	Sheet	
SAE 72	62% Cu, 3% Lead	Free Cut Brass Rod	B 16
SAE 73	60% Cu, 1% Tin	Naval Brass	B 21 Gr. A, B 124 Al 3
SAE 74 (Cartridge)	70% Cu, Bal. Zinc	Seamless Tube	B 129, B 135 Al 2
SAE 74 High Brass	67% Cu, Bal. Zinc	Seamless Tube	B 43 High Brass
SAE 74 Muntz	60% Cu, Bal. Zinc	Seamless Tube	B 111 Muntz
SAE 74 Red Brass	85% Cu, Bal. Zinc	Seamless Tube	B 135 Al 1
SAE 75	99.9% Min. Alum.	Tubing	B 68 Al D B 75 Al D
SAE 76	60% Cu, 1% Tin	Nav. Brass Tube	B 171 N. Brass
SAE 77 Gr. A	95% Cu, 5% Tin, Phos. .25%	Phos. Bronze Strip	B 103 Gr. A
SAE 77 Gr. C	92% Cu, 8% Tin, Phos. .25%	Phos. Bronze Strip	B 103 Gr. C
SAE 79 Gr. A	85% Cu, Bal. Zinc	Red Brass Sheet	B 36 Al 3
SAE 79 Gr. B	80% Cu, Bal. Zinc	Brass Sheet	B 36 Al 4
SAE 80 Gr. A	72% Cu, Bal. Zinc	Brass Wire, Rod	B 134 Al 5
SAE 80 Gr. B	65% Cu, Bal. Zinc	Brass Wire, Rod	B 134 Al 7
SAE 81	95% Cu, 5% Tin, Phos. .25%	Phos. Bronze Wire	
SAE 82	60% Cu, Bal. Zinc	Wire	B 124 Al 1
SAE 83	Copper	Annealed Wire	
SAE 88	60% Cu, 2% Lead	Brass Rod	B 124 Al 2
SAE 110	89% Tin, 3% Cu, 8% Antimony	Bearings	
SAE 110	89% Tin, 3% Cu, 8% Antimony	Ingots	B 23 Al 2
SAE 180	Cadmium 98.25% Min. Silver 1%	Bearings	
SAE 201	97% Min. Al, 2½% Mg.	Wrought	B 109

SOCIETY OF AUTOMOTIVE ENGINEERS SPECIFICATIONS—Continued

Spec. No.	Approx. Alloy	Form	Similar to ASTM
SAE 280	97% Min. Al, 1% Si, ¾% Mg.	Wrought	
SAE 281	Alum., 1% Mg. (61S)	Wrought Al'y	
SAE-E 300	Alum., 6% Si, 7% Cu	Perm. Mld. Castings	
SAE 304	Alum., 5% Si	Sand Castings	B 26 Al S1 or S2
SAE 305	Alum., Si (12%)	Pres. Mld. Castings	B 85 Al 5
SAE-E306	Alum., 8% Si, 1% Max. Fe	Die Castings	
SAE 307	Alum., 4% Cu, 5% Si	Die Castings	B 85 Al 7A B 125 Al 7
SAE-E308	Alum., 8% Si, 2% Max. Fe	Die Castings	
SAE 309	Alum., 4% Ni, 4% Cu, 1% Si	Die Castings	B 85 Al 9 B 125 Al 9
SAE 312	Alum., Cu 7%, Si 2%	Die Castings	
SAE 320	Alum., Si 4%	Sand Castings	B 26 Al G 1
SAE 321	Alum., 11% Si, 1% Cu, 3% Ni	Sand Castings	B 108 Al 6 B 112 Al 6
SAE 322	Alum., Si 5%, Cu 1%	Sand Castings	B 26 Al SC 21
SAE 323	Alum., Si 7%	Sand Castings	B 26 Al SG 1
SAE 324	Alum., Si 4%, Cu 3%	Sand Castings	
SAE-E325	Alum., 1% Si, 5% Cu	Sand Castings	B 26 Al C1 or C2
SAE-E326	Alum., 4% Si, 4% Cu	Sand Castings	
SAE 380	Alum., 3% Si, 5% Cu	Perm. Mld. Castings	B 108 Ty. 1A
SAE 430	65% Cu, 5% Lead, 3% Fe, 3% mn	Mang. Bronze Cstgs.	B 124 Al 6, B 138 Ty. B
SAE 480	55% Cu, 45% Lead	Bearing Alloy	
SAE 481	70% Cu, 3% Tin, 27% Lead	Bearings	
SAE 482	70% Cu, 3% Tin, 27% Lead	Bearings	
SAE 500	Magnesium, Al 9%, Zn 2%	Sand Castings	
SAE 501	Magnesium, Al 9%, Zn 1%	Die Castings	B 94 Al 13
SAE 502	Magnesium, Al 10%	Perm. Mld. Castings	B 94 Al 12
SAE 503	Magnesium, Al 9%, Zn 2%	Perm. Mld. Castings	
SAE 510	Magnesium, Al 3%, Zn 1%	Sheet, Strip	B 90 Al 18X
SAE 511	Magnesium, Al 7%, Zn 1%	Sheet Strip	B 90 Al 8X
SAE 520	Magnesium, Al 7%, Zn 1%	Wrought	B 91 Al 8X
SAE 521	Magnesium, Al 3%, Zn 3%	Wrought	B 91 Al 15
SAE 531	Magnesium, Al 7%, Zn 1%	Forgings	B 91 Al 8X
SAE 532	Magnesium, Al 9%	Forgings	B 107 Al 9X
SAE 640	86% Cu, 10% Tin, 1% Lead, 1% Ni	Castings	
SAE 660	83% Cu, 3% Zn, 7% Tin, 7% Lead	Bronze Bearings	B 144 Al 3B
SAE 701 Gr. A	95% Cu, 5% Alum.	Bars, Shapes	B 124 Al 10
SAE 701 Gr. B Op. 1	85% Cu, 10% Al, 5% Ni	Wrought Al Bronze	B 150, Ty. 1 B 124, Al 11 Op.
SAE 701 Gr. B Op. 2	90% Cu, 10% Al	Bars	B 150, Ty. 2 B 124, Al 11 Op. 2
SAE 791	Zn 4%, Tin 4%, Lead 4%, Balance Copper	Bushings	B 139 Gr. B2
SAE 792	80% Cu, 10% Tin, 10% Lead	Cast Bearing Lining	B 30 Cl. 3A B 144 Gr. 3A
SAE 903	Zinc, Al 4%	Die Casting	B 86 XXIII B 186 XXXIII
SAE 921	Zinc, Al 4%, Cu 3%	Die Castings	B 86 XXI
SAE 925	Zinc, Al 4%, Cu 1%	Die Casting	B 86 XXV B 186 XXXV

STANDARD COPPER AND BRASS PRODUCTS

Average Physical and Chemical Properties

The following tabulation of chemical, physical, and other properties is given only as an indication of what may be expected from the materials and should not be used in ordering. Figures shown are averages only.

	Tubing and Pipe Brass Half Hard	Copper Tubing	Copper Pipe	Copper Water Pipe
% Copper	65 to 68	99.9 Min.	99.9 Min.	99.9 Min.
% Zinc	Balance	.....	.....	.....
% Lead	.8 Max.	.....	.....	.....
% Tin	.....	.....	.....	.....
Density #Cu. In.	.306	.323	.323	.323
Modulus of Elasticity 1,000,000 Lb. Sq. In.	15.0	16.0	16.0	16.0
Melting Point °F.	1700	1981	1981	1981
Coef. Thermal Expansion per °F at 68°F	.0000114	.0000098	.0000098	.0000098
Elect. Conductivity % IACS at 68°F	26.4	102.	102.	102.
Thermal Conductivity BTU/Sq. Ft./Ft./Hr./°F at 68°F	69	227	227	227
Average Tensile Strength #Sq. In.	Tube–50000	Annld–30000 ½H–40000	.....	Types K&L Soft–40000 All Types Hard–48000 Min.
Numbers Hard	.....	.....	.....	.....
Rockwell	Tube–B50/B75	½H B25/B50 B68–43	.....	.....
Nearest ASTM Spec.	Tube–B135–43T Al. 3 Light Drawn Pipe–B43–42 High Brass	B75–43T	B42–43	B88–41

Bars and Rods

	Free Cutting Leaded Brass Half Hard	Copper Soft	Copper Hard	Naval Brass Half Hard	F. C. Phos. Bronze Half Hard	Comm. Bronze Half Hard	Brass Wire	Soft Copper Wire	Phos. Bronze Spring Wire	18% Nickel Silver
% Copper	61.5	99.9 Min.	99.9 Min.	60	88	90	65	99.9 Min.	95	55
% Zinc	35.5	.....	.....	Balance	4	10	35	.....	.....	Balance
% Lead	3.0	.....	.....	.20 Max.	4	.....	.....	.....	Phos. .25	Nickel–18
% Tin	.....	.....	.....	.75	4	.....	.....	.....	.5	.....
Density #Cu. In.	.307	.322	.322	.304	.320	.318	.303	.322	.320	.314
Modulus of Elasticity 1,000,000 Lb. Sq. In.	15.0	16.0	16.0	15.0	15.0	15.0	15.0	16.0	15.0	18.0
Melting Point °F.	1652	1981	1981	1640	1875	1913	1661	1981	1922	1930
Coef. Thermal Expansion per °F at 68°F	.0000113	.0000098	.0000098	.0000119	.....	.0000101	.0000116	.0000098	.0000099	.0000083
Elect. Conductivity % IACS at 68°F	28.6	101.6	101.6	25.8	12.0	43.6	28.6	101.6	18.4	5.6
Thermal Conductivity BTU/Sq. Ft./Ft./Hr./°F at 68°F	73	227	227	68	.....	108	73	227	47	18
Average Tensile Strength #Sq. In.	50/60000	32000	45000	55/60000	60000	58000	Soft–50000 ¼H–65000 ½H–85000 Spg.–125000	S–38000	Spg.–125000	S–65000 ½H–80000 Spg.–125000
Numbers Hard	2	Annealed	4	2	.....	.....	.....	.....	.....	.....
Rockwell	B60/B75	Avg. F25	Avg. B45	Avg. B65	Avg. B75	Avg. B60	.....	.....	.....	...
Nearest ASTM Spec.	B16–42	B124–42T B133–42T	B124–42T B133–42T	B21–42T Gr. A B124–42T Alloy 3	B139–42T Gr. B2	B134–42T Alloy 2	B134–42T Alloy 7	B3–41	B159–43T Gr. A	B151–42T Gr. B

STANDARD COPPER AND BRASS PRODUCTS
Average Physical and Chemical Properties

The following tabulation of chemical, physical, and other properties is given only as an indication of what may be expected from the materials and should not be used in ordering. Figures shown are averages only.

Sheets and Strips

	Sheet 70-30 Soft Temper	Yellow Brass		Spring	Rich Low-Red Brass		Sheet Com. Bronze Soft	Com. Bronze Half Hard	Gilding Metal Soft	Engravers Brass Half Hard	Phos. Bronze Spring
		Half Hard	Hard		Soft	Half Hard					
% Copper	70	66	66	66	85	85	90	90	95	63.5	95
% Zinc	30	34	34	34	15	15	10	10	5	35.0	.....
% Lead	.....	.....	....	.....	.....	.....	.....	.....	.....	1.5	Phos. .25
% Tin	.....	..	.....	.....	.....	.....	.....	.	.....	.....	5.
Density #Cu. In.	.308	.306	.306	.306	.316	.316	.318	.318	.320	.306	.320
Modulus of Elasticity 1,000,000 Lb. Sq. In.	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Melting Point °F	1751	1700	1700	1700	1870	1870	1913	1913	1949	1680	1922
Coef. Thermal Expansion per °F at 68°F	.0000111	.0000114	.0000114	.0000114	.0000104	.0000104	.0000101	.0000101	.0000100	.0000111	.0000099
Elect. Conductivity % IACS at 68°F	27.3	26.4	26.4	26.4	34.7	34.7	43.6	43.6	57.0	26.8	18.4
Thermal Conductivity BTU/Sq. Ft./Ft./ Hr./°F at 68°F	70	69	69	69	87	87	108	108	139	69	47
Average Tensile Strength #Sq. In.	49000	60000	73000	90000	40000	56000	38000	52000	37000	60000	100000
Numbers Hard	.....	2	4	8	Annealed	2	Annealed	2	Annealed	2	8
Rockwell	B30 Avg.	B57/B74	B76/B84	B87/B92	F60 Avg.	B56/B71	F50 Avg.	B50/B66	F50 Avg.	B57/B74	B88/B96
Nearest ASTM Spec.	B36-43T Alloy 6	B36-43T Alloy 7-8	B36-43T Alloy 7-8	B36-43T Alloy 7-8	B36-43T Alloy 3	B36-43T Alloy 3	B36-43T Alloy 2	B36-43T Alloy 2	B36-43T Alloy 1	B121-43T Alloys 4-5	B103-43 Gr. A

Russian Substitute Palladium in Dental Alloys

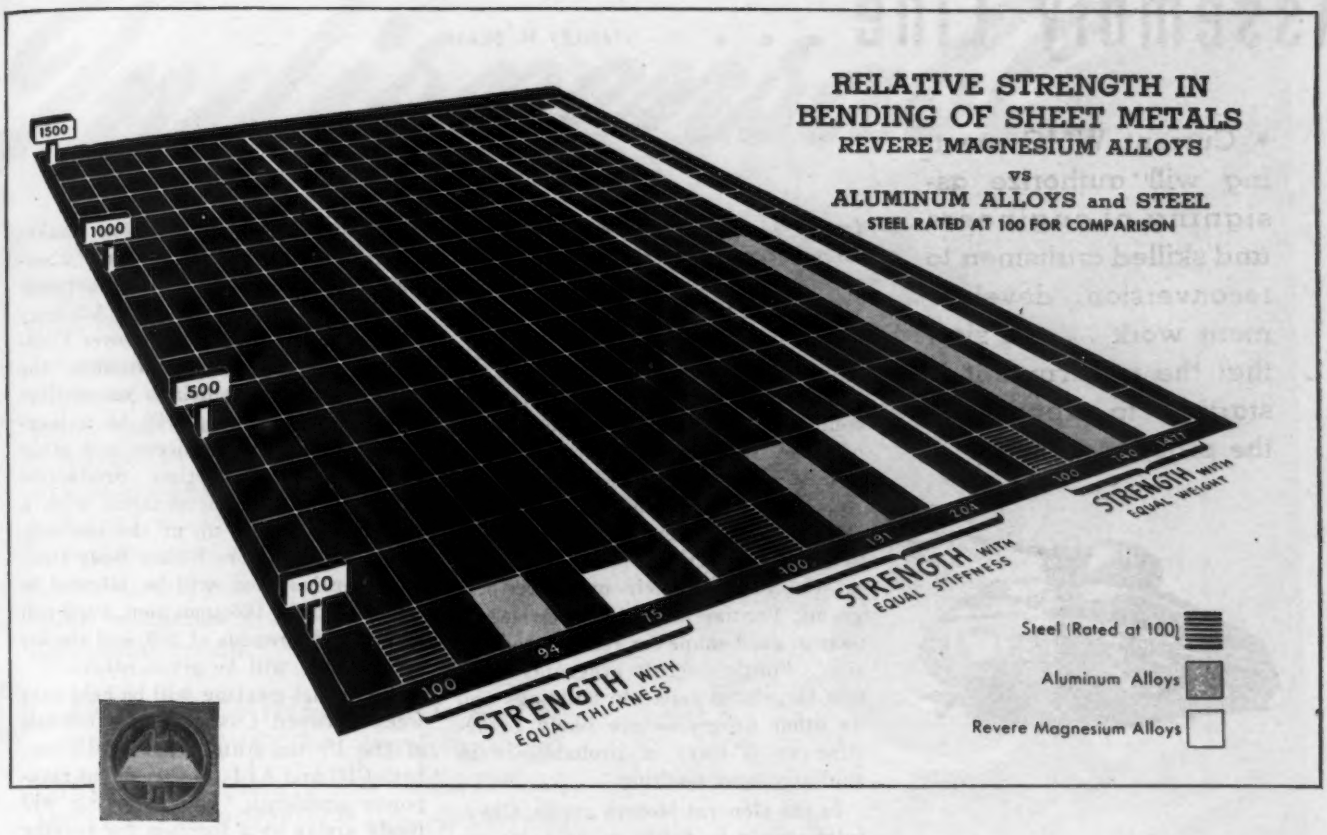
THE pins and sleeves used to attach porcelain teeth to false plates have to satisfy severe conditions. In addition to having a sufficient hardness and tensile strength at room temperature, they must be ductile enough to be drawn into wires and stand up to stamping and, the most exacting test, should not deterioriate when the teeth with the pins and sleeves are "burnt" at 2192 deg. F. V. A. Nemilov and A. A. Rudnitskii (*Russian Journal of Applied Chemistry*, 1942, 15, 87) describe some alloys which fulfill all these requirements satisfactorily.

The alloys used at present (in Russia) are (1) Au 63, Pd 30, Pt 7, and (2) Au 58, Pd 39, Pt 3. In an attempt to substitute palladium for the more expensive gold, Nemilov and Rudnitskii prepared the alloys (3) Au 47, Pd 50, Pt 3, (4) Au 39, Pd 58, Pt 3 and (5) Au 32, Pd 65, Pt 3. A more considerable cheapening was attempted by making alloys without either platinum or gold, namely, (6) Pd 90, Ag 10, (7) Pd 80, Ag 20, (8) Pd 70, Ag 30, and (9) Pd 60, Ag 40. Four other alloys containing palladium, silver and copper have been prepared as well but the amount of copper (2 per cent) admissible is so small that no worthwhile saving can be achieved by employing these ternary alloys instead of the corresponding binary Pd-Ag alloys.

No. of Alloy	Melting Range Deg. F.	Brinell Hardness	Ultimate Tensile Strength Lb. Per Sq. In.	Total Elongation Per Cent	Specific Gravity
1	2687 to 2649	53.0	5.0	34.0	16.4
2	2737 to 2700	53.5	4.7	35.3	15.6
3	2784 to 2746	60.5	4.8	36.0	14.7
4	2871 to 2831	60.0	4.6	35.0	14.1
5	2860 to 2826	58.0	4.4	35.0	13.7
6	2739	54.0	4.5	34.0	11.7
7	2662	64.0	5.6	40.0	11.6
8	2525	62.5	5.5	43.0	11.5
9	2507	56.0	5.2	44.0	11.4

The chief mechanical properties of the nine above mentioned alloys after annealing at 1832 deg. F. are listed in the table. It is seen that the cheapest alloys (5) to (9) are at least as strong and ductile as the most expensive alloys (1) and (2).

The solidus temperature of the alloys (6) to (9) is not recorded in the paper, but is stated to be so high that the heating to 2192 deg. F. does not affect the shape of parts made from these alloys. The alloys (6) to (9) are visibly oxidized at 932 to 1832 deg. F., but the oxides formed decompose at a higher temperature, and the metals show no trace of oxidation after being kept for 30 min. at 2192 deg. F. and then rapidly cooled in air.



Hand-Operated Items. Anything pushed, pulled, lifted, carried. Vacuum cleaners and other household appliances; baby carriages; hand and portable tools; typewriters; instrument cases; luggage; hand trucks and dollies; mailing containers.

Reciprocating Parts. Anything that must be started, stopped, reversed in motion. Light weight and rigidity save power, reduce vibration.

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Write for your complimentary copy of the *new* 32-page booklet, "Revere Magnesium Alloys and the Light Metals Era," now coming off the presses. Presents the basic facts about magnesium, plus detailed technical data on the physical, mechanical and working characteristics of the Revere Alloys.

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Assembly Line . . .

STANLEY H. BRAMS

• Current WMC meeting will authorize assigning of engineers and skilled craftsmen to reconversion development work . . . A sign that the government is starting to appreciate the problems ahead.

DETROIT—The combing out of the tangled threads of reconversion has begun. Action toward this end began after Labor Day while the auto industry was still engaged in a vigorous campaign started in August to impress Washington with the necessity of speeding the solution of changeover problems.

There was more than met the eye in Washington's announcement that 37 per cent of outstanding Army contracts would be cut back the day Germany falls. Release of a figure established that the Army has now completed what might be called a plan of de-action on Victory Day in Europe. More important, it serves as inferential notice that the manufacturing companies involved in those cutbacks now have a fairly good idea of their own individual situations.

Some automotive companies have learned in detail their position in Period One—that immediately following victory. Others do not yet know. In all cases, the development, analyzing and reacting to such information is being most carefully handled in topmost executive offices.

Company positions become generally apparent in the light of word that the Army will cut back vigorously except in a number of specified items, all needed for the Pacific war. These include certain aircraft, heavy trucks, big guns, tires, heavy artillery ammunition and certain radar equipment, these being the only items in which the auto industry has a production stake.

On that basis, an outside look at the production situations of the various companies furnishes good indication of where they will stand on European V-Day. With diminished need for the jeep, Willys-Overland is ready to switch almost overnight into civilian production. With emphasis eliminated on the bulk of their ordnance programs, Pontiac and Olds likewise appear in good shape for ready reconversion. Ford's aircraft programs function largely in separate buildings and its other programs are likely to decline on V-Day; it probably is in similarly good position.

In the General Motors group, Chevrolet should be fairly ready to reconvert; Buick and Cadillac somewhat less so. In Chrysler, the Dodge and Plymouth divisions, largely identified with tank component output, should be relieved of armament burdens rather more than Chrysler and DeSoto —and the latter will be tied up for a long time with its B-29 assignment.

Among the independents, the enviable position of Willys-Overland seems followed, in rough order, by Studebaker, Packard, Hudson and Nash-Kelvinator.

Some companies whose chances for reconversion are brightest, on the basis of the general and specific knowledge they have received from Washington, have gone a step further and placed actual orders for components. These are now in the hands of vendors awaiting release, complete as to shipping quantities but incomplete in many instances as to price.

• • • To speed its reconversion preparations, Packard Motor Car Co. has bought the Hern Ave. plant of Bundy Tubing Co., at Detroit, giving it 110,000 ft. of floor space. Work for 1200 men machining Rolls-Royce engine crankcases will be transferred at once to this new plant, freeing space at the main Packard plant for automotive production equipment. H. A. Garvey, veteran Packard manufacturing executive, will manage the new plant.

Concurrently, reconversion makeready is well begun. A meeting scheduled for Sept. 14 in Detroit between the Automotive Industry Advisory Committee and War Manpower Commission officials will formalize the placement of technicians on civilian jobs. All companies will be authorized to transfer engineers and other specialists to peacetime production preparations. In accordance with a formula to be set up at the meeting, the General Motors Fisher Body Division, for instance, will be allowed to transfer about 165 such men, Ford will be granted upwards of 200, and similar permissions will be given others.

A parallel meeting will be held next week between Cushman and officials of the United Auto Workers Unions, both CIO and AFL, to thresh out manpower problems. This meeting will likely arrive at a formula for moving limited numbers of skilled hourly-paid workers into reconversion "makeready." In all cases, both as regards the technicians and the craftsmen, transfers will be predicated on policy calling for no impairment of war work programs.

As soon as these two meetings are out of the way, conferences will be held with engineering companies in the Detroit area, and then with tool and die companies, to work out formulas for further reconversion planning and manufacturing. Thus, by the end of September, the preparatory stage will be fairly well developed.

Problems still remain, despite this optimistic flurry — problems whose solutions have not yet been arranged, and which prompt the continuation of the get-busy propaganda drive which the auto industry is aiming at Washington. The industry is still not satisfied with arrangements for clearing plants of government equipment—a complaint which has been blunted by aged and frequent repetition, but one which is none the less urgent. The industry is equally as bothered, but not as vociferously, over the machine tool situation.

To resume auto output on a minimum basis, which will be the operating program for the first three months after Germany's collapse, the auto companies need a total of approximately 11,600 machine tools. Of these slightly less than 8000 are required new, as announced at the meeting of

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Not one square foot of strategic enemy territory escapes the aerial camera's searching, all-seeing eye. Fairchild Camera & Instrument Corporation manufactures the bulk of these vital cameras which must be ruggedly built to withstand all kinds of operating conditions such as extremes of temperature and humidity. Above all, they must be compact and *precision-made* to guarantee swift, clear, and utterly dependable results.

Putting the "Eye" on the enemy. Army photographer using the Fairchild K17 camera for oblique photography. This same unit is also used for mapping and reconnaissance photography. *U. S. Army Air Force Photo*

2 THE MACHINES THAT MAKE THESE "EYES" — precision machines like the P&W VERTICAL MILLER and PROFILER which shapes vital parts to critical tolerances.

Seating surfaces on film magazine base plates, camera bodies, and lens cones — which must be held to tolerances as close as ±.0003" — are machined on the Pratt & Whitney Vertical Miller & Profiler (Fairchild has 10 of these in constant operation). If specified tolerances are not held here, the focus of the camera lens would be affected. On precision machining of the many irregular castings, Fairchild uses a double-spindle set-up on this machine.

In vitally important work like this where accuracy and dependability coupled with swift production and low cost are prime requisites, the P&W Vertical Miller & Profiler is proving itself "best for the job" 365 days a year. For full details, write Pratt & Whitney, *Division* Niles-Bement-Pond Company, West Hartford 1, Connecticut.

Accuracy in Action. For machining the body casting of a K18 camera, Fairchild uses a fly cutter operation on a P&W Vertical Miller and Profiler. This is the critical surface upon which the lens cone is attached and must be accurate.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

auto presidents with WPB in July, and about 3700 might be purchased from DPC equipment in war plants.

Many companies are placing orders for the machine tools they need, but are worried over the lack of positive delivery dates. Promises of four-month delivery or so, the average on standard tools, are conditioned by the fact that rated government orders which may be placed at any time can lengthen delivery promises indefinitely.

Then, too, purchasing agents are rather hesitant about placing orders for machine tools when they realize that government machines may become available at any time, at lower prices. Existence of a vast store of equipment which may become surplus at any vague moment is acting to hold up a number of orders.

As matters stand today, these surpluses are hedged by regulations which make purchase quite difficult. For example, before a company can place an unrated machine tool order for civilian goods production, the requisition must first go to WPB for screening against outstanding stocks of tools declared surplus by the service arm holding them. At present these stocks are rather small, because comparatively few of the machines are released to date. However, some machines of the type sought are thus located. The would-be purchaser then has to negotiate for acquisition.

But the services still retain control over this machinery. And although the Surplus War Property Administration has developed a formula for the selling of surplus machine tools (THE IRON AGE, July 20, 1944, page 114), the use of this formula by the service arms has not yet been authorized by Ordnance, the Air Forces, or the Navy, custodians of nearly all such equipment. Accordingly, sales of this sort are practically at a standstill.

Beyond that, it should be added, there is no thorough satisfaction in industry circles with the purchase price formula itself. It is pointed out that it does not differentiate for machines used one, two or three shifts, nor does it differentiate between machines whose service life is shorter or longer than the average. Some company purchasing people who feel that the July 14 formula of SWPA is a good start in the right direction believe that it should be modified into an arrangement somewhat like the Canadian formula, which provides for price variance in such cases.

These problems may act to delay the resumption of automobile production beyond necessary lengths unless they are ironed out very quickly. Every day that brings the European war closer to its end must be used to advantage in the reconversion planning, or needless unemployment will follow the contract cutbacks on V-Day.

New Airplane Parts Listings May Save Manufacturers 53 Per Cent

• • • Savings to aircraft manufacturers and the government of as much as 53 per cent may be effected on freight shipment costs, through industry use of the comprehensive billing descriptions listed in the Blue Book of Airplane Parts, compiled by the traffic department of the Aeronautical Chamber of Commerce of America.

Filling a long recognized need, the publication is the result of many months of study and research. It provides the only authoritative source of such information for aircraft traffic executives.

In addition to assuring application of the lowest shipping rate, the Blue Book lists the various parts entering into aircraft construction under their technical and common names and discloses the manner in which the shipment should be billed to the carriers.

Billing descriptions used are those found in the Railroad Consolidated Freight Classification. These descriptions readily apply to articles moving under class rates, and where the items are shipped under commodity rates, or under exceptions to the classification, interpretations can be worked out in accordance with the information supplied by the Blue Book.

An example of the savings which might be effected is shown by reference to a single item:—Electric engine starters. These could be billed as "Airplane Parts," which would require 50 per cent over first class freight rates. By reference to the Blue Book, however, it is shown that they should be billed as "Electric Motors" which in the consolidated freight classification takes second class rates, and in many exceptions third class, thus reflecting a direct saving of 43 per cent or 53 per cent, respectively.

TRAVELING X-RAY: *Naval officers supervise the loading of a million-volt industrial X-ray machine into a Navy transport plane at Chicago. The powerful General Electric arrived six hours later at the Norfolk Navy Yard where it was urgently needed.*

FOR CONTROLLED FLOW OF FUEL OIL
this oil burner nozzle must be held to an exact tolerance. Because Carpenter Stainless No. 5 was supplied uniform, shipment after shipment, it consistently produced more perfect parts than could be obtained from other metals. With the reduction of rejects and increased tool life, costs were substantially reduced.
GOOD FINISH AND CLEAN THREADS
on these valve parts are clearly evident. Again the uniform easy-working qualities of Carpenter Free-Machining Stainless No. 5 helped the valve manufacturer turn out more perfect parts at a minimum cost.

REDUCE YOUR COSTS

In Machining Stainless Parts

The oil burner nozzle part illustrated above is just one example of the way Carpenter Free-Machining Stainless Steels help to reduce unit costs in machining Stainless parts. Tool breakage was running excessively high on this job—as were rejects due to the fact that close tolerances, such as on the nozzle hole, could not be held uniform. As soon as Carpenter Free-Machining Stainless No. 5 went on the job improved results were immediately evident. The uniform quality of this Stainless grade licked production headaches and brought costs quickly in line.

Carpenter skills and ingenuity in manufacturing Stainless Steels date back to the early days when we helped pioneer these steels and invented the Free-Machining grades. We have made it our business to know all about these versatile metals and how they can best serve the needs of Stainless users. Out of this experience has come improved laboratory and inspection controls that assure consistent uniformity in physical characteristics and easiest fabricating qualities for all Stainless grades.

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Washington . . . .

L. W. MOFFETT

• Krug credited with fast action on elimination of controls plan . . . Fall of Germany to mean 40 per cent cutback on war contracts . . . About 4,000,000 workers to be released.

WASHINGTON — The decision by the War Production Board on Sept. 5 to free all manufacturing from WPB controls on X-Day except those plants and factories devoted to filling military needs can be credited to a large extent to WPB's new acting-chairman, J. A. Krug.

While it is said that the idea was approved by the President before representatives of war agencies unanimously concurred at the WPB meeting, and WPB Chairman Donald M. Nelson was in favor of lifting controls, it was really Mr. Krug who sold the idea.

Mr. Krug says that the cutback upon the fall of Germany will amount to more than $26,000,000,000 or 40 per cent of the $66,000,000,000 being spent annually for munitions. Approximately 4,000,000 workers will be released to take jobs in civilian industry, Mr. Krug said.

An additional cut of $14,000,000,000 or 20 per cent of the military program can be expected within 90 days after the fall of Germany.

Whether this further cut is made depends upon the speed of the war against the Japanese, and the results of the procurement agencies' constant review of programs.

There is disagreement upon the effect of laying off 4,000,000 to 5,000,000 workers. Mr. Krug says that there will not be a great unemployment problem because industry converted to war production without one, despite the dire predictions of some economists.

Termination telegrams will go out on X-Day, and the entire 40 per cent cutback is supposed to be effective within two weeks. Some government economists are predicting that there will be a $10,000,000,000 loss in consumer purchasing power which will increase as the cutbacks exceed 40 per cent.

One economist who believes there will be an unemployment problem is Maurice Livingston, chief of the National Economic Unit of the Bureau of Foreign and Domestic Commerce. Mr. Livingston says that the problem will be aggravated, depending upon the number of men demobilized by the Army and Navy.

Mr. Livingston told THE IRON AGE that there may be "almost over-night a re-employment of 1,500,000 to 2,000,000 workers who have been laid off in industries where there is no reconversion problem."

On the other hand, if war industries are suddenly cut 40 per cent or more, the re-employment of 3,000,000 workers may take from one day to six months, depending upon the speed of reconversion.

There will be no subsidiary unemployment in distribution or service industries because of their pent-up demand for manpower. The consensus of government economists interviewed is that while the cutbacks will shake the economy, they won't send it into a tailspin.

Reaction was immediately joyous upon the decision to snap government controls. Many said that the promise to keep the government out of the reconversion picture is the greatest boost civilian morale has been given since the war began. Industry hopes that the promise is kept.

Hiland G. Batcheller, president of Allegheny Ludlum Steel Corp., who returned last week to resume his old post as WPB Director of Industry Operations, said that no one in Washington can realize the relief felt by business people who have worried lest production controls continue after the period they are needed. Mr. Batcheller said that his immediate attention will be devoted to stepping up lagging military programs and assisting industry in reconversion.

Pointing out that it will be impossible to "wet nurse" industries in the readjustment period, Mr. Krug said that he knew of no major industry which does not have extensive postwar plans. WPB industry divisions will be kept intact to assist large and small business to find suppliers, and the principle of production directives will be used to prevent large material users from getting an unreasonable amount of any material or product.

Industry Advisory Committees will be retained, and a simple priority system has been provided for the use of the Armed Services in continuing the war against Japan. The spot authorization plan will be abandoned as soon as Germany capitulates.

Mr. Krug said that the cutbacks would make it possible for industry to produce civilian goods equal to the volume produced in 1939. He declared that there would be plenty of steel, aluminum, copper and other materials to satisfy almost any demand up to this limit.

This prediction would mean that civilian production would rise 30 per cent in a year, according to WPB figuring.

At present, approximately 18,000,000 tons of finished steel are being devoted to non-munition purposes. The proposed cutback will free an additional 20,000,000 tons of finished capacity, Steel Division officials estimate.

Possibly 12,000,000 tons of steel is uncut and in inventory, and will be available for civilian use. However, not all of it will be suitable for civilian needs. Perhaps another 6,000,000 tons will turn up as "in process" most of which will be good as scrap only.

Estimates of what the operating rate will be immediately after X-Day range from 40 to 50 per cent because of surpluses in inventory, to 65 to 75 per cent within a few months depending upon the speed of reconversion.

No product shortage is expected, and it is thought that not more than 6,000,000 tons of finished products will be in demand immediately.

The Army Ground Forces program will be slashed 50 per cent and these terminations will be felt immediately. This means a saving of 10,000,000 tons of finished steel for civilian purposes on an annual basis.

The Army aircraft program will be cut $4,000,000,000 or 20 per cent of the $20,000,000,000 obligated. These terminations will come right away and free about 400,000 workers according to WPB estimates.

The aircraft cut is not expected to result in more than a 20 per cent further cut in aluminum output because of cutbacks which have recently taken

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Now, when you have to drive each furnace to produce every possible ingot, don't take a chance on tapping an off-grade heat that's been contaminated by a badly fouled bottom. Don't let production slow down due to more and more delay time, trying to patch an undependable old bottom.

Actually, it will save time to take time now to clean all lime, slag and steel out of an old hearth and resurface it with Basifrit. Then you can make steel faster—on a sound, clean bottom which protects quality—and delay time between heats will be reduced to a minimum, quickly making up the hours spent in installing the Basifrit.

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place in this industry. Aluminum production was as high as 188,000,000 lb. a month at one time, and has now been cut back to 90,000,000 lb. a month.

Stacy May, director of the Planning and Statistics Division said that Navy requirements would be cut back 20 per cent and the Maritime Commission needs would be cut back 50 per cent in a year's time. These cuts are expected to be tapered.

Secretary of the Navy James V. Forrestal said recently that the Navy Department expected no cutbacks upon the defeat of Germany. The Maritime program is up in the air, and anything can happen to it in the way of a drastic cut in the opinion of many government officials.

WPB officials say that copper, zinc and lead supplies will be ample, while one official said that copper supply will be 125 per cent more than was available in peacetime.

The Planning and Statistics Division now has all figures on the prospective cutbacks, and is calculating the regional and city impact.

Other sources say that the Detroit area war work will be cut as much as 50 per cent, releasing enough capacity for the production of an estimated 2,000,000 cars in the first year manufacture is permitted.

Some fears have been expressed that the smaller sized manufacturers will suffer under the decision to abolish all WPB controls. WPB officials believe that with the surpluses which will be available in all materials and many components formerly in tight supply, and new open capacity, no manufacturer will have trouble getting what he needs generally.

Of course, no responsible official interviewed said that there will be no bottlenecks in the new civilian manufacture. These are bound to occur, but it is believed that they will be the exception rather than the rule.

One official of the Machine Tool and Equipment Division said that the Army and lend-lease have not told WPB what X-Day means in tools. This same official said that because of the non-cooperation of the services the great excesses in tools have not been uncovered, and that if the machine tool order E-1-b is lifted, only large companies will be able to get new tools.

This is true, it was pointed out, because already, automobile companies are after tool makers with postwar orders which are being pushed at them with such celerity that if they are all filled there will be little chance for smaller concerns to get tools.

o o o

Adopts New Reconversion Policy

Washington

• • • **WPB Deputy Executive Vice** Chairman Arthur H. Bunker recently disclosed that the board has adopted a reconversion policy of encouraging the transfer of war production from plants that may readily be reconverted to civilian production to special-purpose plants, such as Willow Run. This policy was made known to representatives of the Ford Motor Co. and the UAW-CIO. Present also at the meeting were representatives of the Army Air Forces and the WMC.

The meeting was called to determine what work can be put into the Willow Run plant to replace the production of B-24 Liberator bombers, which is being sharply reduced. Provided it can be done without interfering with the war effort, WPB officials said that the board favors moving additional aircraft work into the Willow Run plant.

With this purpose in mind, Howard C. Porter, chairman of the military subcommittee of the WPB Production Executive Committee staff has gone to Wright Field, Dayton, Ohio, for a discussion with Brig. Gen. B. E. Meyers, chief of the Army Air Forces Materiel Command. He will report back to the WPB Production Executive Committee staff.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

HERE'S TH' PLANS FOR THE NEW ADDITION ON TH' SHOP-- WE'VE GOT TWELVE NEW BORING MILLS ORDERED AND WE'VE GOT TO GET TH' BUILDERS BUSY AT ONCE!
NO! NO MORE INDOOR FARMS ADDED HERE! PUT THEM MACHINES RIGHT IN HERE -- I DON'T NEED A COVERED COUNTY TO PRESS BUTTONS! I DON'T WANT TO HAVE TO LEARN ANOTHER LANGUAGE WHEN I GO TO TH' FAR END O' TH' SHOP!
THE OL' BULL WASN'T BORN WITH A GOLD YACHT IN HIS MOUTH AN' HE HATES WASTIN' MONEY!
WHEN THEY FIRST BUILT THIS OFFICE HE SEZ, "PUT MY DESK WHERE FIRST BASE USED T'BE AN' LEAVE TH' BLEACHERS FER SHELVES!"
J.R.WILLIAMS
CONCRETE PRAIRIES
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9-15

Honor John A. Dillon At Capitol Luncheon

Washington

• • • **Luncheon at the** Washington Hotel yesterday honored John A. Dillon, who is leaving the Office of Defense Transportation soon for private industry. Tweney-five men from ODT and WPB attended.

Gen. Charles D. Young, deputy director of ODT, and H. H. Kelly, director of materials and equipment division, ODT, were among the guests.

Mr. Dillon is a director of the Standard Stoker Co., New York, and Erie, Pa., and was formerly vice-president of Pittsburgh Screw & Bolt Corp., New York.

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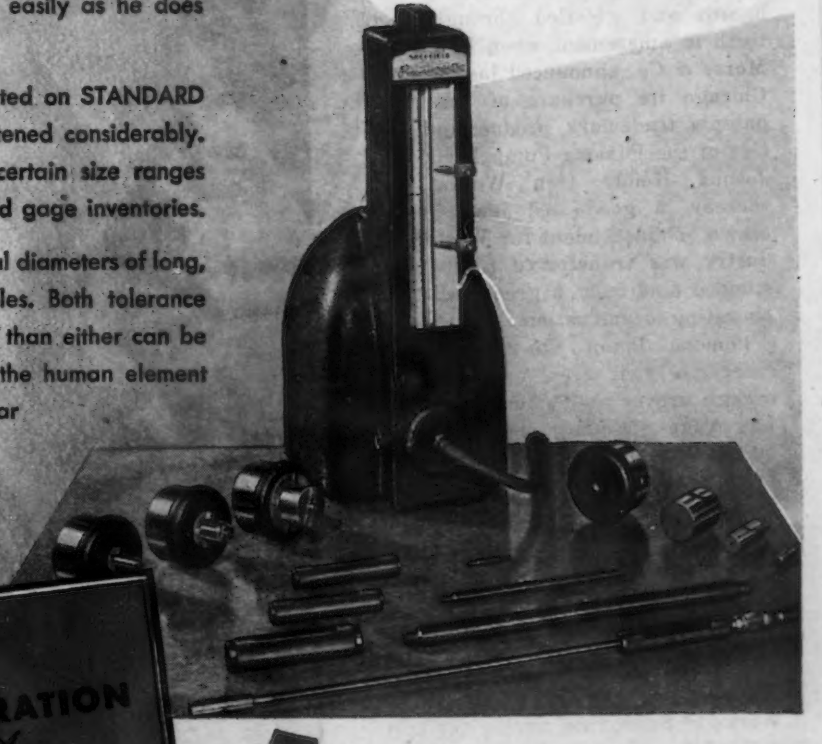

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WEST COAST . . . OSGOOD MURDOCK

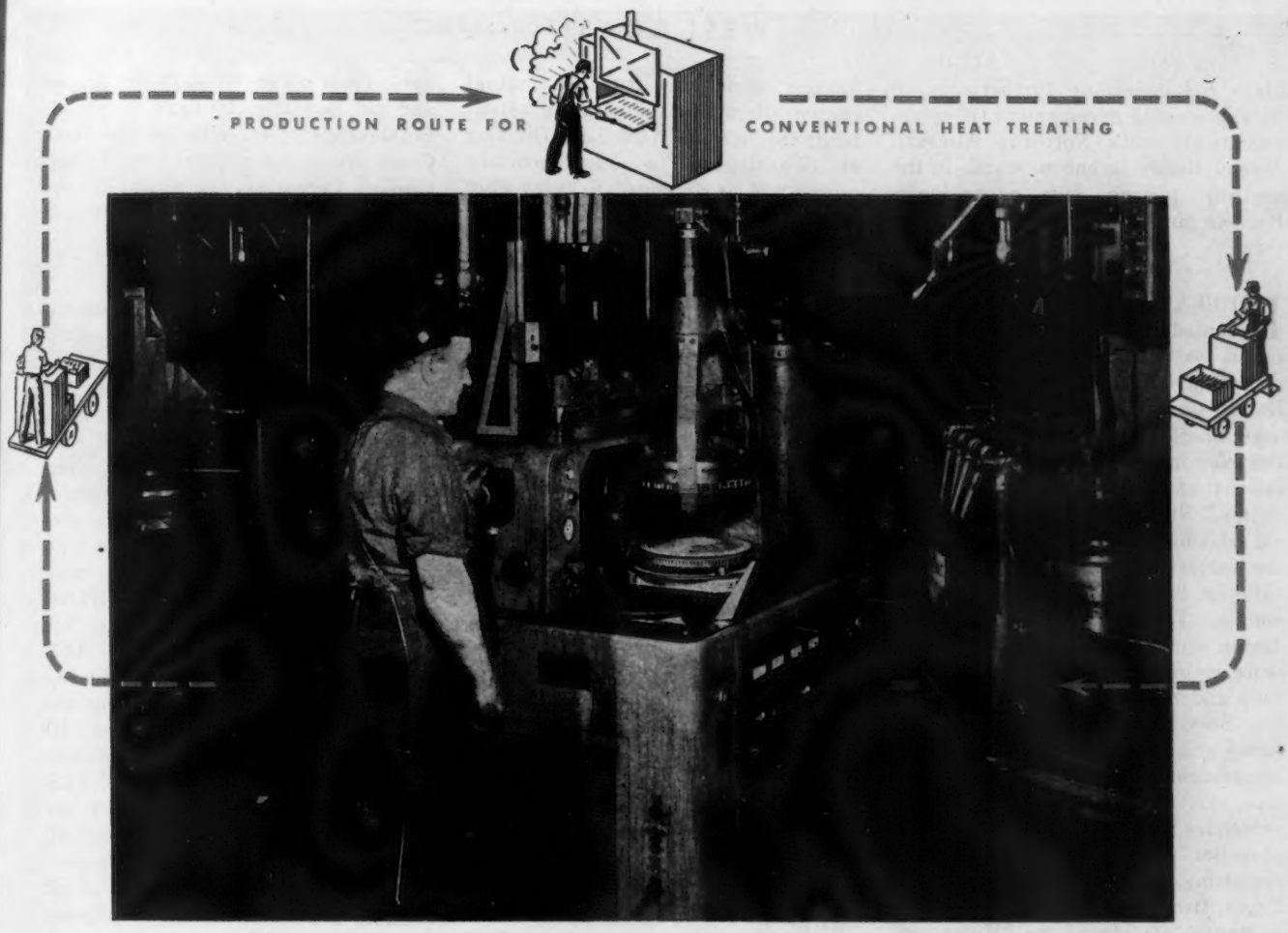
• Joshua Hendy surprises apostles of regional independence by selling Pomona Pump Division to Fairbanks Morse . . . Geneva produced and shipped 43,000 tons of plates and shapes in August.

SAN FRANCISCO—Regional postwar promoter-planners and sideline coaches for the industrial future of the far West took a deep breath and whistled through their teeth in amazement when Fairbanks-Morse & Co. announced last week at Chicago its purchase of the plant, patents, trademark, product and prestige of the Pomona Pump Division of Joshua Hendy Iron Works. For, thereby, a good-sized jewel in the crown of independent far Western industry was transferred to the well-studded diadem of a great nationally operating organization.

Pomona Pump Co. is a native enterprise that grew up among the orange groves at Pomona in eastern Los Angeles County and achieved a position of leadership in the manufacture of turbine pumps especially adapted for irrigation and heavy duty water supply. Three or four years ago this healthy native son purchased the Westco Pump Division of Micro-Westco Inc. with a plant at St. Louis, thereby extending eastward its territory and manufacturing facilities. About a year ago Joshua Hendy Iron Works of Sunnyvale, among the apricot and prune orchards of the Santa Clara Valley, purchased its citrus contemporary at Pomona and consolidated executive offices and management. It was naturally assumed that pump and hydraulic equipment would be a major interest of Joshua Hendy postwar, and that all manufacturing would be consolidated in the big, well-equipped, elaborately machine-tooled Hendy main plant. It is understood that the plant at Pomona is outgrown and handicapped for space and that the original management, when independent, two purchases back, had planned to move or rebuild.

Fairbanks-Morse has long operated large distribution branches at Los Angeles, San Francisco, Portland, and Seattle. Some years ago the company purchased the independent C. W. Price pump manufacturing plant at San Francisco, and has since operated it as its Price Pump Division. Joshua Hendy retains a new plant built by Pomona at Torrance for the wartime manufacture of marine pumps. It is understood that Hendy's original purchase of Pomona anticipated important maritime contracts which did not materialize and, apparently, in its postwar plans the management is disinclined to enter a field that requires separate engineering for each installation and almost the individual attention of a tailor shop applied to heavy agricultural and rural units. Primarily wartime marine engine builders, including reciprocating steam for Liberty Ships, and steam turbines for Victory Ships, Joshua Hendy management under energetic, big-visioned, resourceful Charles E. Moore is thought to be anticipating possible diesel en-

TRANSPORT MAINTENANCE: *At Fairfield, Cal., an aircraft maintenance crew services one of the huge transport ships at the Army air field. Working along with two GI mechanics is a woman civilian technician.*



WHY ISOLATE YOUR *HEAT TREATING?*

WILLYS-OVERLAND MOTORS, Inc., reports this time-saving idea in the manufacture of flywheel ring gear assemblies for the famous Jeep:

A compact, cool, clean TOCCO machine—used for shrink-fitting—is spotted between two milling machines which perform related operations. Conventional heating practice . . . cumbersome, hot and dirty . . . would have required isolation of the shrink-fitting operation and a costly production detour. The handy TOCCO set-up allows this efficient procedure:

The man shown in the picture machines one side of cast iron flywheel in machine at left . . . places it and ring gear in TOCCO work fixture . . . presses TOCCO start button.

The TOCCO machine automatically heats ring gear to 400°F. in 12 seconds, expanding its 12″ diameter .025″ . . . lowers ring gear and presses it on flywheel . . . quenches ring gear, cooling and shrink-fitting it to flywheel.

A second man removes the assembly from TOCCO and machines other side of flywheel in machine at right.

Since TOCCO almost operates itself, only two men are required for this three-machine set-up.

Find out how TOCCO can solve many of your present and postwar production problems. The book, "Results with TOCCO," will be sent free on request.

THE OHIO CRANKSHAFT COMPANY • CLEVELAND 1, OHIO

TOCCO

INDUCTION

HARDENING . . BRAZING

ANNEALING . . HEATING

gines and depending furthermore on its engineering development tie-up cooperatively with Northrup Aircraft. Joshua Hendy is one to watch in the postwar picture but, surprisingly, Pomona pumps will not be part of the view.

INDEFATIGABLE Henry J. Kaiser planted one more promising shoot in his well fertilized and wondrously expanding experimental plot when his Kaiser Cargo Inc. at Richmond took over Stanley Hiller, Jr., 19-year-old Berkeley inventor, and his rather sensational and locally publicized "Hillercopter." Stanley started as a 12-year-old schoolboy in a shop in his home in the exclusive Claremont district by building his own one-cylinder automobile. To produce the helicopter during wartime he already has several score employees at quite a downtown shop and has been deferred by Selective Service at the insistence of the Army and against his own wishes and preference. His helicopter not only flies but has incorporated certain principles and applications of variable propeller pitch that seem unusually promising. Chief test pilot, W. H. Engel, from Kaiser's Fleetwing plant at Bristol, Pa., found the "Hiller-copter" superior in controllability and with less vibration than any helicopter he has flown. Young Hiller will design and supervise construction of wingless aircraft in a new factory to be Kaiser-built in Berkeley.

GENEVA Steel Co. produced 39,500 tons of plates and 3500 tons of shapes in August and shipped them all to the West Coast for forced draft maritime construction. Fortunately Geneva has been steadily accelerating during recent months when the Fontana mill has run into production difficulties and has fallen behind on some schedules and estimates. Geneva's management was not unhappy to be able to take over and fulfill some of these schedules. Labor is still scarce and coke continues to be the production bottleneck affecting Utah acceleration.

Geneva's shell steel schedule has been lifted and deferred to postpone first deliveries until after the first of the year. During the fourth quarter the DPC Utah mill will concentrate on plates and shapes and even its sale of foundry iron to the coast custom market will be limited. For the past four or five months Geneva has supplied all foundry pig for West Coast requirements, averaging some 8000 tons per month, but for the fourth quarter and thereafter, by mutual consent of producers operating voluntarily through the WPB Steel Division at Washington, a supplementary source will be arranged to carry part of the load. Neither Fontana nor Columbia at Provo seem ready or anxious to undertake this little extra load just now, so a part of the West Coast foundry pig may come in from more distant furnaces where production may be economically scheduled.

Steel deliveries on rated orders on the West Coast are now 30 days on bars, from 60 to 90 days on shapes and not less than 90 days on plates. Bethlehem's 18-in. mills on the West Coast are at the present time booked through December, and except for reinforcing bars no facilities have less than 60 days backlog.

* * *

In California for the past year up to Sept. 1, CIO reports a membership gain of "at least 25,000" to bring its total membership in the state now "in excess of 200,000." State and Federal manpower statisticians agree that over one million persons are employed in manufacturing plants in California, and at least that many more in service, transportation, and trade. So that CIO membership is still a relatively small percentage. In 283 NLRB elections 29,412 votes were cast for CIO unions, 24,678 votes for AFL unions, 968 for other unions and 19,858 against any union. During the past year for the first time since CIO was founded, its locals in California have won a greater number of NLRB elections than AFL. That 35.9 per cent of those voting were against all unions and that the number of organized workers is still a minority of all workers is in contrast to the impression gained by the general public from either official or labor spokesmen.

* * *

These coming three months will see a transcontinental rail transportation pinch more serious than at any time during the past three years, according to F. T. Westmeyer, district manager for the Association of American Railroads at Seattle. He points out that freight loadings in July approximated the peak in October, 1943, the month when maximum traffic always occurs.

* * *

According to Senator Wallgren of Washington in a statement at Spokane the R. J. Reynolds industries have "started negotiations" toward the purchase of the aluminum reduction plant there for operation after the war. If the Senator is serious, and if Reynolds is, thereby hangs a tale. Reynolds Metals Co. has its own $5,000,000 reduction plant at Longview, Wash., with 33,000 tons annual capacity. The DPC reduction plant at Spokane costs approximately $25,000,000, has 97,500 tons annual capacity and is operated by Alcoa. Bullish indeed is the private enterprise that now invests gold and/or silver, or certificates therefore; in aluminum reduction facilities in the Pacific Northwest at anywhere near par.

Cited for Awards

• • • **The following companies** have received awards for excellence in war production:

Army-Navy E

Rheem Mfg. Co., Chicago.

Maritime M

Babcock & Wilcox Co., Barberton, Ohio. (third star)

Buckeye Iron & Brass Works, Dayton, Ohio. (third star)

Columbia Steel Co., Pittsburg, Cal. (third star)

Colvin-Slocum Boats, Inc., New York. (third star)

Dri-Steam Products, Inc., New York. (third star)

Eastern Cold Storage Insulation Co., New York. (third star)

Edward Valve & Mfg. Co., Inc., East Chicago, Ind. (third star)

Edwards & Co., Inc., Norwalk, Conn. (third star)

Fort Pitt Steel Casting Co., McKeesport, Pa. (third star)

Jenkins Brothers, Bridgeport, Conn. (third star)

Lewis Bolt & Nut Co., Minneapolis. (third star)

John Lucas & Co., Inc., Philadelphia. (third star)

Maine Steel, Inc., South Portland, Me. (third star)

Mercer Tube & Mfg. Co., Sharon, Pa. (third star)

Mine Safety Appliances Co., Pittsburgh. (third star)

National Tile & Marble Corp., New York. (third star)

Paxton-Mitchell Co., Omaha, Neb. (third star)

Pitcairn Co., Barberton, Ohio. (third star)

Radiomarine Corp. of America, New York. (third star)

Simplex Wire & Cable Co., Cambridge, Mass. (third star)

W. & J. Sloane, New York. (third star)

Socony Paint Products, Division of Socony-Vacuum Oil Co., Inc., New York. (third star)

Sterling Steel Foundry Co., Braddock, Pa. (third star)

Ed. Steves & Sons, Steves Sash & Door Co., San Antonio, Tex. (third star)

Summer Iron Works, Everett, Wash. (third star)

L. Theiss & Sons Corp., Maspeth, N. Y. (third star)

Trill Indicator Co., Pittsburgh. (third star)

Turl Iron & Car Co., Inc., Newburgh, N. Y. (third star)

Union Steam Pump Co., Battle Creek, Mich. (third star)

Kelvin & Wilfrid O. White Co., Boston. (third star)

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PERSONALS

HOWARD E. ISHAM, assistant vice-president, U. S. Steel Corp. of Delaware.

• **Howard E. Isham** has been appointed assistant vice-president of the U. S. Steel Corp. of Delaware. In addition to his new duties, Mr. Isham will continue as assistant treasurer. Mr. Isham first came to U. S. Steel subsidiaries in 1938 when he joined the staff of M. D. Howell, then vice-president of Carnegie-Illinois Steel Corp.

• **Richard E. Posthauer** has been made manager of military contracts and service of the Lycoming Division of The Aviation Corp., Williamsport, Pa. Mr. Posthauer has a background of 16 consecutive years of aircraft activities and comes to Lycoming from Northwestern Aeronautical Corp., where he was chief of contracts and assistant to the president.

• **Gustuf A. Ostrom** has joined Foote Mineral Co., Philadelphia, as a research engineer. Mr. Ostrom was formerly with Philco Radio Corp.

• **E. J. Finkbeiner**, who has served in the operating department of American Car & Foundry Co. since 1922, has been appointed a vice-president. He will continue in the operating department under the direction of Frederick A. Stevenson, president, in charge of operations. Mr. Finkbeiner has been associated with the company for 40 years. **Olin H. Philips** has been placed in charge of the laboratory metallurgical research work of all American Car & Foundry plants, succeeding **John W. Steinmeyer** who has been transferred to the New York Research Department.

• **Foster E. Fike** has been appointed manager of the Rock Falls, Ill., plant of the Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y., succeeding the late Allen N. Bradford. Mr. Fike has been with the company for 37 years.

• **Thomas Bartlett** has recently joined the staff of the Lawrance Aeronautical Corp., Linden, N. J., as operations manager. Mr. Bartlett has been associated with Curtiss-Wright at Buffalo.

• **William W. Knight, Jr.**, who has been sales engineer of the Morgan Construction Co., at Pittsburgh, has joined the engineering department of the rolling mill division, at the home office of the company in Worcester, Mass.

• **E. W. Hoster, Jr.**, has been appointed resident manager of sales of the Columbus sub-office, Jones & Laughlin Steel Corp., Pittsburgh. Mr. Hoster has been a resident salesman in Columbus since 1940 and has been with J & L seven years.

• **R. J. Davis** has been appointed works manager and **John Solomon**, assistant works manager, Union Steel Castings Division of the Blaw-Knox Co., Pittsburgh. **R. J. Heinz** has been made general superintendent and **J. M. Poklemba**, superintendent of the division.

R. J. DAVIS, works manager, Union Steel Castings Division, Blaw Knox Co.

WILLIAM G. WALTERMIRE, sales engineer, Lamson & Sessions Co.

• **William G. Waltermire** has joined the Lamson & Sessions Co., Cleveland, as sales engineer. For the past two years he was staff engineer for the National Screw Machine Products Association.

• **Fred O. Kolberg** has been appointed works manager of Warren City Mfg. Co., Warren, Ohio. For the past two years he has served in various production capacities with the Crosley Corp.

• **Luther L. Jaynes** has been made manager of the Sheet Sales Division, Wheeling Steel Corp., Wheeling, West Va. Three assistant managers have been appointed to assist Mr. Jaynes; **Clyde L. Cunliffe, Glenn D. East**, and **Robert L. Fleming.**

• **Elbert E. Hoffman** and **John M. Birdsong** have joined the metallurgical engineering staff of the La Salle Steel Co., Chicago. Mr. Hoffman was formerly with American Steel & Wire Co. Mr. Birdsong was formerly connected with the General Electric Co.

• **Charles S. Mattoon**, director of industrial relations for the Airplane Division of Curtiss-Wright Corp., Buffalo, has resigned to serve for a period of several months as an industry member of the National Airframe Panel of the WLB in Washington. Upon returning to Buffalo, Mr. Mattoon plans to open offices as a consultant on industrial relations problems.

KRESTON T. SORENSEN, vice-president in charge of production, William Sellers & Co., Inc.

• **Kreston T. Sorensen** has been made vice-president in charge of production, William Sellers & Co., Inc., Philadelphia. Mr. Sorensen has recently been in charge of design of weapons and material for the Ordnance Department, having charge of the engineering section located at the Franklin Institute. Until 1941 he had been with Baldwin Locomotive Works in charge of heavy tank design.

• **Earl J. Senne** has been appointed sales manager of the Spring Division of the Cleveland Wire Spring Co. Mr. Senne has served in a sales capacity with this company since 1910. **Joseph F. Ursem**, who has been with the company continuously since 1896, and since 1903 as sales manager of the Spring Division, has retired.

• **Charles J. Hardy, Jr.**, formerly a member of the law firm of Hardy, Stancliffe & Hardy, and until recently on active duty with the U. S. Navy, has been elected a vice-president and a director of American Car & Foundry Co. Among his duties will be the handling of public relations.

• **E. D. Page** has been appointed controller of the Colorado Fuel & Iron Corp., Denver, Colo.

• **Leonard S. Hobbs** has been elected vice-president for engineering, and has also been appointed a member of the operating and policy committee of the United Aircraft Corp., East Hartford, Conn. **Wright A. Parkins** has been appointed engineering manager, Pratt & Whitney Aircraft Division.

• **Lt. Gen. William S. Knudsen** has been named director of the Air Technical Service Command, which is a consolidation of AAF Materiel and Services, the AAF Materiel Command at Wright Field, Ohio, and the Air Service Command at Patterson Field, Ohio. **Maj. Gen. Bennett E. Meyers**, former deputy assistant chief of the Air Staff, Materiel, Maintenance and Distribution, and commanding general of the Materiel Command, has been appointed deputy director. This consolidation effects economies in administration and brings all such activities under Gen. Knudsen, who is also director of production in the Office of the Under Secretary of War.

• **M. K. Saunier** has been appointed to represent Progressive Welder Co., Detroit, in the Chicago area, succeeding **Wallace A. Stanley**. Mr. Stanley, who has been with the company for the past 7½ years, returns to Detroit to become special assistant to E. J. DelVecchio, field sales manager.

• **Capt. E. D. Almy**, formerly assistant general manager, Joshua Hendy Iron Works, Sunnyvale, Cal., has been made manager of the Crocker-Wheeler Division of the organization at Ampere, N. J. He succeeds **A. J. M. Baker** who has resigned to become executive vice-president and general manager of the E. W. Bliss Co. Succeeding Mr. Almy as assistant general manager in Sunnyvale, is **Harry C. Gunetti**, who has served for more than three years as general superintendent. **Robert Mann** has been appointed general superintendent. **Edgar C. Brandt** has been appointed assistant to the general manager of the Crocker-Wheeler Division.

• **H. W. Davis** has been appointed assistant manager of sales of the Sheet and Strip Steel Division of the Weirton Steel Co., Weirton, West Va. Mr. Davis has been with the Weirton Steel Co. for more than 14 years. For the past two and one-half years he has served with the Sheet and Strip Steel Branch of the WPB. Mr. Davis succeeds the late L. W. Briggs.

• **C. C. Franck** has been appointed manager of land turbine engineering in the Steam Division of the Westinghouse Electric & Mfg. Co. **L. C. Fletcher** has been made steam application engineer in the marine section; **S. W. Schmidt** has been appointed supervisor of subcontracting and **J. R. Thomas**, superintendent of fabricating and welding.

G. RIDER NEFF, general sales manager, Cleveland Cap Screw Co.

• **G. Rider Neff**, of the Lamson & Sessions Co., Cleveland, has resigned after 16 years service to join the Cleveland Cap Screw Co. as general sales manager. In 1937 Mr. Neff was appointed sales manager of the Stove Bolt Division of Lamson & Sessions and in 1939 was made sales manager of the Aircraft and Special Products Division. He advanced to advertising manager and manager of Aircraft and Special Products Division in 1942.

OBITUARY...

° ° °

• **Raleigh H. Barnes**, 46, assistant director of research of the American Steel & Wire Co., Cleveland, died suddenly September 2. Mr. Barnes had been with American Steel & Wire since 1920, holding various positions in the metallurgical department. In May of this year he was appointed assistant director of research.

• **Charles P. Connell**, associated with the Moore Drop Forging Co., Springfield, Mass., for 32 years, the last eight as superintendent of the Chicopee Division, died recently. He was 52 years old.

• **Thomas J. Costello**, retired manufacturing executive, died recently at Detroit. He had been factory manager of Hupmobile, Willys-Overland and Chrysler.

• **William E. Wehr**, vice-president of the Wehr Steel Co., Milwaukee, and one of four brothers who organized the firm in 1910, died August 24.

Fatigue Cracks . . . BY A. H. DIX

Cure for Conversational Anemia

• • • The next time the table talk falls on its face from lack of red corpuscles you can give it a transfusion by saying, "Speaking of unusual names of towns, there is one near Philadelphia with the unrestful, callipygous name of Bustleton." This nodule of knowledge, picked up from a recent issue, will cause your companions to vie with each other in citing quaint municipal appellations, and in the excitement someone else will pick up the check.

Thus you will again be rewarded for faithful reading of your favorite family journal, which in addition to girding you in a flawless armor of professional knowledge, provides you with oddments of information that serve as adrenalin to be injected when conversational fatigue failure is imminent.

Natural for a Sanitarium

• • • Bustleton's antithesis is a name on a road sign along the main route from New York to Ingersoll-Rand's plant in Phillipsburg, N. J. The sign reads "5 Mi. to Still Valley." As this is applejack country, the "Still" may be there for reasons other than peacefulness, and for all we know the town may be full of hyperthyroids. But we never pass the sign without a strong urge to follow it.

Robot Revealed

• • • Until two weeks ago we always faltered over the word "robot," not knowing whether it was pronounced *roe-boe, rob-bot, roe-bott, roe-bote, or rob-bote.* But we know now, as our contemporary, Westbrook ("Sunshine") Pegler, has written a column on it. It is *roe-bott,* with the accent on the first syllable.

It was introduced into our language in 1921 by Capek's play, "Rossom's Universal Robots," and comes from the Polish word for work, *robota.* We thought that our subscriber, the Robot Engineering Co., of Pasadena, Calif., would like to know how to pronounce its name.

Blue Ribbon To Gopher Trap Maker

• • • Our guess is that California leads in proportional industrial gains since the war began, as our flock of subscribers there is up 136 per cent since 1939. If you asked us our cognominal choice we would unhesitatingly answer "The Z. A. Macabee Gopher Trap Co."

The stencil tells us the manager is Mrs. Lucile Evans. There is no favoritism in this, as we don't know Mrs. Evans from Eve. It is simply that we like the name—*Z. A. Macabee Gopher Trap Co.* The address is pretty, too—Loma Alta Ave., Los Gatos.

Welcome Mat Removed

• • • We see by our Washington bureau's dispatches that business paper editors are no longer admitted to the weekly press conferences with the President. The gatherings had been getting too large and are now restricted to newspaper people.

Of course, our feelings are hurt, but we will risk the obvious sour grape accusation by saying that it would be easy to exaggerate our loss. "Moff," our No. 1 chair in Washington—christened Leon W. (for Wesley) Moffett—took us to a couple of the meetings. After the initial feeling of awe had passed and after we got over fearing that one of the G-man guards would shoot us on the spot whenever we reached for our handkerchief, we began to realize that there can be little value in the meetings other than as a democratic symbol.

For the top man of any giant organization is usually a poor news source. His occasional epochal announcements are usually about matters that were common knowledge weeks before. His position requires him to be guarded in his statements and skilled in the art of removing the firing pin from a loaded question so that it becomes a harmless dud.

He must have a finger in every pie, but he can hardly be expected to know much about the contents of any one of them. The newsgatherer must therefore cozy up to those who actually prepared the dough and the filling, and officiated at the baking.

We do not recall that we were ever given the low-down on anything by the current president or by his predecessors, but we do recall that one of the predecessors rebuffed a member of the brains department for assuming that the question, "How are prospects in your industry?" called for a candid reply.

Therefore, we think that even if the plug in our pipeline to the White House becomes permanent, we will survive.

Misplaced Modifier

. . . I quote from a caption on page 135 of your Aug. 24 issue, ". . . obstructions had to be removed frequently to make way for . . ."

Persistent obstacles, eh what?

—*Elton Sterrett*

The erring caption writer has been ordered to stay from five to six every night for a week and write on the big blackboard in the brains department, "*Frequently* obstacles had to be removed . . ."

Misplacing a modifier can sometimes have alarming results. Our friend George Carroll Buzby saw a lady create consternation in a super market by picking up several bunches of celery and asking the clerk, "Will this be enough for twelve people stewed?"

Singular Oversight

. . . While on the subject of grammar ("Low Moan from Woollcott's Shade," Aug. 31 issue) a singular verb (has) should have been used in the sentence, "Now that each of us have . . ."

How proud my English teacher would be if she knew I was correcting editors of prominent magazines!

—*W. E. Stuber, Continental Can Co.*

Our turn at the blackboard begins Monday.

Jap Map Drops Two Colors

• • • Al Smith once told a political aspirant, "Never get too far ahead of the parade or people won't know your leading it." We thought of that in connection with our 11-in. by 29-in. map of industrial Japan. It appeared in our Apr. 30, 1942, issue when bombing was just germ in the Doolittle cerebrum.

The brains department prepared it, starting from 10 ft. behind scratch, as the Japanese were not lavish with industrial information. The map originally appeared in three colors, but as the plates had been remelted, we could reprint it in only one color. However, it looks very nice, and if you want one, send us 25c to pay for the mailing tube, the postage, and for our trouble in sending it to you. Stamps will do. We are at 100 E. 42nd St., New York 17.

Puzzles

• • • Among the answers to last week's hair remover are: $428^2 = 183{,}184$, $573^2 = 328{,}329$, $727^2 = 528{,}529$, and $846^2 = 715{,}716$.

Par for this is 90 seconds:

Every day at noon a ship leaves New York for Lisbon, and at the same instant a ship leaves Lisbon for New York. Each trip lasts exactly 96 hours, or 4 days. How many ships from Lisbon will each ship from New York meet?

A name worth remembering!

FAIRBANKS-MORSE

After the war, the name Fairbanks-Morse will continue to mark performance-proved products only, as it has for 114 years.

No race to get civilian products onto the market early will tempt us to break this pledge.

Fairbanks-Morse Scales are precision-built instruments which provide mechanically perfect weight recording. Of sturdy scientific construction without springs or delicate parts, the countless types, styles, and modifications serve American business and industry by keeping books, records, and inventories, saving time, preventing errors, and speeding production.

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FAIRBANKS, MORSE & CO., CHICAGO 5, ILLINOIS

Dear Editor:

WELDING AT WILLOW RUN

Sir:

I would like a copy of an article in a recent issue dealing with spot welding processes developed by Ford. Please send it with invoice.

H. GARSIDE,
Chief Tool Engineer
Victory Aircraft, Ltd.,
Box 430, Terminal "A,"
Toronto

● "Aluminum Welding at Willow Run" appeared in our March 30 issue. We are sending it, no charge.—Ed.

AIRCRAFT SHEET METAL PARTS

Sir:

We would appreciate a set of clippings of the four-part series, "Making Aircraft Sheet Metal Parts," in your May 28, June 4, 11, and 18, 1942 issues.

T. N. SHAFFER,
Chief Aircraft Tool Designer
Engineering and Research Corp.,
P. O. Box 209,
Hyattsville, Md.

TOOL STEEL DIRECTORY

Sir:

About three years ago you published a list of 1500 tool steels. Can we obtain a reprint copy?

J. O. EVANS,
Engineering Dept.
Rheem Manufacturing Co., Inc.,
Box 4027, Station F,
New Orleans, La.

● The new, revised edition of the Tool Steel Directory is just off the press. The size is 5 in. x 7 in. 80 pages, price $1.—Ed.

PRECISION CASTINGS

Sir:

We have read numerous articles about the reproduction of small gears by accurate casting processes in which no further machine work is required. Also we have read about a casting process called the wax-free method. Could you put us in touch with organizations specializing in this type of work?

J. D. BUNCH,
Manager
Bunch Motor Co.,
2251 East 7th St.,
Los Angeles 23

● Among the sources of supply of small parts made by the lost wax process are Precise Castings, Inc., a division of Cooper Alloy Foundry Co., 165 Bloy St., Hillside, N. J.; J. R. Wood Products Corp., 216 E. 45th St., New York; B. F. Hirsch, Inc., 175 Varick St., New York; and Trifari, Krussman & Fishel, Inc., 387 Charles St., Providence 4, R. I. The Iron Age has published several articles on the process, of which the most recent is, "Industrial Precision Castings," Sept. 7 issue, page 73.—Ed.

DIE CASTING OF PLASTICS

Sir:

I have a question I am asking you because I feel you will be honest in answering it. It is this: I have applied for a patent on a small gage and I have in mind die casting it. Is the white metal the cheapest or is plastic the cheapest? Is there any priority needed for any of the material? I mean white metal or plastic.

L.H.M.
Pottstown, Pa.

● White metal may be cheaper if the quantity to be made is small, say 500 or less. In larger quantities plastics may hold the advantage. Inasmuch as white metal is now being used for various costume jewelry items, you can doubtless get it without priority. Certain of the plastics are under strict priority, but we believe that a few are available for other uses. Whether these types would be suitable for your purpose we cannot tell without information as to the application of the gage.—Ed.

HIGH PRECISION MILLERS

Sir:

On page 63 of your Aug. 17 issue you show a diagram of a battery of high precision millers. Can you tell us who makes this machine?

A. R. HORTON
Morrow Screw and Nut Co., Ltd.,
Ingersoll, Ont.

● A. Bechler, Moutier, Switzerland.—Ed.

KARFOAM

Sir:

On page 58 of your Aug. 3 issue you have an article regarding Karfoam Auto Oil Soap. Can you tell us where we can obtain a sample shipment?

D. A. LOUCKS,
General Purchasing Agt.
Canadian Car & Foundry Co., Ltd.,
621 West Craig Street,
Montreal

● The product was manufactured by the Karfarm Corporation, Philadelphia. However, we understand that the producer has since gone out of business. C. C. Wood, plant superintendent, of the Chevrolet Gray Iron Foundry, Saginaw, Mich., may know whether there is a successor.—Ed.

MACHINE CLASSIFICATION

Sir:

We are interested in obtaining a standardized code for machinery and equipment by function and capacity. Do you know where we can get any information?

CYRIL S. MARTIN
Section Supervisor
Lockheed Aircraft Corp.,
Factory "A,"
Burbank, Cal.

● General Motors Corp. uses such a system. We suggest you write to Harold T. Johnson, Manager, Standards Section, General Motors Corp., General Motors Bldg., Detroit, Mich.—Ed.

GLUED STEEL

Sir:

We have just read, "The Strength of Glued Sheet Metal" in your Aug. 24 issue. We also read with much interest, "Mr. Saunders' Magic Glue," in the April Reader's Digest. Can you tell us where we can get this material?

E. O. COLE,
President
Cole Manufacturing Co.,
Charlotte, N. C.

● Several companies have recently developed adhesives for metal, among them U. S. Stoneware Co., Akron, Ohio, and B. B. Chemical Co., Cambridge, Mass., to which we suggest you write.—Ed.

RUST PREVENTIVE

Sir:

We are interested in obtaining complete information regarding the "thin film" rust preventive treatment described in the article, "Navy Develops Rust Preventive," printed on page 94 of your June 29 issue. To whom should we address our inquiry?

T. R. McLAIN, JR.
National Tube Co.,
Frick Bldg.,
Pittsburgh, Pa.

● To Lt. Comdr. B. R. Lewis, USNR, Container Section, Bureau of Supplies and Accounts, Room 2715, Washington 25.—Ed.

TIME STUDY COMPUTATIONS

Sir:

I noted with interest the article "The Right and Wrong of Time Study Computations" appearing in your Aug. 17 issue. I feel this article has an important bearing on our work here and would appreciate a half dozen reprints.

I. GALPER,
Production Planning and Control
Premier Crystal Laboratories, Inc.,
53-63 Park Row,
New York 7

● This is the first of a three-part series. The second and third parts will appear soon. When the series is completed, reprints will be available.—Ed.

SENSITIVE SPECTROGRAPH

Sir:

On page 80 of your Aug. 17 issue you mention a new spectrographic method "sensitive to 0.0007 per cent boron." Where can we get additional information?

C. H. FLICKINGER,
Metallurgical Research and
Development Division
Republic Steel Corp.,
3100 East 45th St.,
Cleveland

● Write to Dr. Lyman J. Briggs, National Bureau of Standards, Washington.—Ed.

TUBE BENDING ALLOY

Sir:

Can you give me any information on Wood's Metal, Cerrobend or some similar low melting point alloy used in tube bending?

BRUCE FOX
Bruce Fox Aircraft Parts,
New Albany, Ind.

● Wood's metal is a generic term applying to fusible alloys whose chief constituent is bismuth. It can be obtained from practically any white metal producer. Cerrobend, a modified Wood's metal, is a trademarked product made by the Cerro de Pasco Copper Corp., 40 Wall St., New York. For data on the use of Cerrobend in tube bending see "How to Bend Tubes and Sections," in the Nov. 7, 1940, Iron Age.—Ed.

"Some Trolley Ride those springs take!"

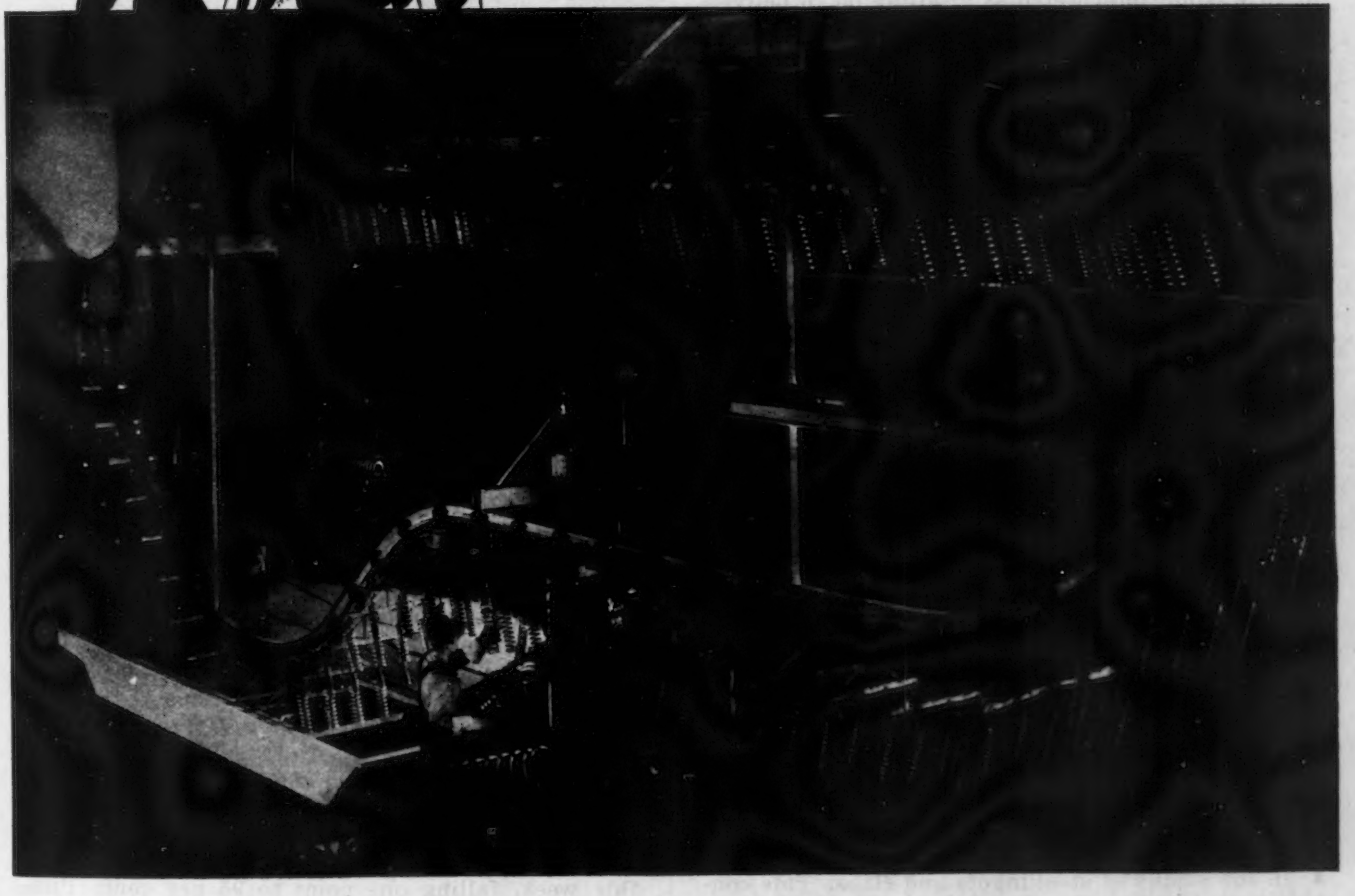
A MUCH-IMPRESSED visitor to the Muehlhausen hot-coiling plant made this comment after inspecting the enameling and baking "station" shown below—the "end of the line" for thousands of springs each day.

This mechanized process is typical of the streamlined set-up in the Muehlhausen hot-coil plant, which is devoted entirely to producing large springs.

Specialized equipment, such as *automatic* hot-coiling machines, *block-long* heat-treating lines, *precision* grinding facilities, all on a smooth running production-line basis, assures Muehlhausen customers of quick delivery on large springs of *any design,* in *any quantity,* and to *split-hair tolerances.*

Check with Muehlhausen on your large spring problem—your production schedule and product both will benefit!

MUEHLHAUSEN SPRING CORPORATION
Division of Standard Steel Spring Company
817 MICHIGAN AVENUE • LOGANSPORT, INDIANA



WRITE FOR LARGE SPRING FOLDER!
Showing the extensive facilities at Muehlhausen for making large springs.

To improve product performance, use

MUEHLHAUSEN Designed SPRINGS

This Industrial Week . . .

- **Pressure for Deliveries Off Some**
- **Order Volume Drops Sharply**
- **Scrap Composite Down 84c. a Ton**

EASING of pressure on some steel deliveries, excesses of ingots and slabs in some areas, sharp price declines in some major scrap grades, a further drop in the steel ingot rate and an increase in cancellations and cutbacks this week, gave additional support to the belief that steel buying is either on a downward trend of significant proportions or at least is definitely leveling off from the war's high marks.

While steel deliveries this week were still at high levels, the same brand of tempo which existed a few months ago had started to disappear. This condition was not interpreted as a falling off in deliveries for urgent materials, but rather reflected the extreme cautiousness on the part of steel consumers. This week found the latter again eyeing their inventories and attempting to guess when the war will end so that stocks might be treated accordingly. For the first time there is widespread evidence that the armed forces are severely trimming advanced steel requirements in order to bring them in line with military probabilities.

Barring an immediate armistice there is a strong possibility that by the time arms actually are laid down, the lessened requirements will have been well discounted in steel schedules and the actual impact of order cancellations cushioned to some extent.

Reliable reports are current this week that the landing mat program will be cut back 50 per cent by October and possibly 75 per cent by November. The shell steel program which at one time soared to an anticipated peak of over half a million tons per month to be reached by January of 1945, now appears to have reached a plateau, with further rises improbable. It is understood November and December shell steel production which was to have risen sharply will stay close to October levels. There are some astute sources who believe that although the shell steel cutbacks were instituted originally because of holdups in shell making equipment, they may become permanent, and quite possibly be expanded.

IN the past week there has been a further easiness in the supply of steel ingots and slabs. This condition resulted from the inability of some steel mills to process these additional semi-finished steel supplies because of the manpower situation. Hence, steel companies which a few months ago were disposing of a portion of their ingots and slabs over and above their own finishing needs find no ready market for this material. This condition alone may be responsible to some extent for the drop in the steel ingot rate this week.

Cancellations of business on steel mill books has increased from a snail's pace to a modest clip with aviation components manufacturers particularly prominent. Schedules for long ternes are expected to be cut soon and some contracts are understood to be cancelled for the production of a certain type of ammunition.

Steel order volume this week dropped considerably from the pace existant a month ago. At some steel plants shipments in the past week have been ahead of new order volume. Steel order backlogs are beginning to be pared, although the rate of reduction will not be accelerated to any extent until cutbacks now in the making find their way to the steel mills. The sum total of the current news in the steel and metal working industries is to accentuate more cautious buying and to head towards a situation similar to what was known in the prewar days as "living off inventories."

There were definite indications this week that the scrap market had developed a substantial crack and the trend in prices for open hearth grades was definitely downward. Declines occurred in No. 1 heavy melting steel at Pittsburgh, Chicago and Philadelphia. These reductions had the effect of reducing THE IRON AGE scrap steel composite 84c. a ton to $18 a gross ton. Another crack in the market developed this week when some major consumers insisted on and gained the re-establishment of a differential between No. 1 heavy melting steel, No. 2 heavy melting steel and bundles.

A SUMMARY of important opinion from Washington indicates the following miscellaneous news items: WPB estimates that there are a billion pounds of aluminum in inventory available for civilian use on X-day; it is estimated that a billion pounds of aluminum scrap is also present; prewar consumption of aluminum may be doubled in the postwar era; Acting WPB Chairman Krug has picked as a mainstay committee for reconversion the following young men: Samuel Anderson, chief WPB Program Bureau; A. C. C. Hill, Jr., deputy vice-chairman Civilian Requirements Committee; Lincoln Gordon, assistant director of Program Bureau; Andrew Stevenson, assistant to the Director of Industry Operation; Albert Butler, the Program Bureau; I. N. P. Stokes, of WPB Legal Division.

Steel operations continued their downward trend this week, falling one point to 95 per cent. Pittsburgh output was down two points to 91 per cent and at Chicago production declined half a point to 100 per cent. Other districts that showed a drop in operations were: Youngstown, down one to 95 and Cincinnati, down four to 95. Birmingham at 99 per cent this week rose seven points from last week's revised rate of 92. Detroit at 102 per cent gained four and a half points from the revised rate of 97.5 last week. The Western District rate rose half a point to 89 per cent and in the Eastern District operations increased 21 points to 94.5. Philadelphia at 98.5; Buffalo at 104.5; Cleveland at 94.5; Wheeling at 91 and St. Louis at 106 continued unchanged.

• **INVASION PIPE**—A sudden and terrific demand for invasion pipe for the European theater has dumped a very heavy load on some of the pipe mills. In addition to the normal uses of this pipe by the armed forces for transporting such commodities as gasoline and oil, it is believed that this pipe will be used in re-installing the wrecked utility services of recaptured European cities. Such services, in addition to water and gas, are believed to include sewage lines. By the application of a so-called Russian coating, believed to be perhaps an asphalt base lacquer of some type, it is reported that the pipe lines thus installed will be every bit as serviceable as those destroyed by the shelling and bombardment. While it is not known for certain, the installation of such equipment will probably be made by Army engineers.

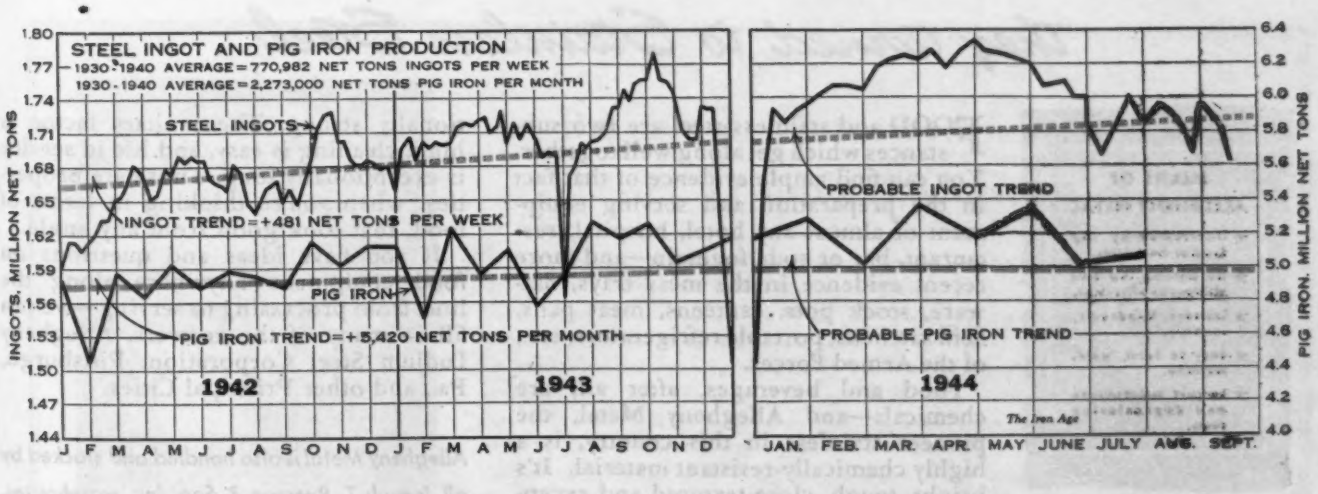
• **POSTWAR RECONVERSION**—Machine tool builders and distributors indicate that the reconversion program is well underway, according to their order books. Indications now are that at least 50 per cent of the tool buying that is being done now is with an eye to the use of such tools after the war, and much of it is, in reality, buying for a postwar product. Top in this type of buying are the railroads, which have set up a tremendous program of rehabilitating shops. Specification committees have been appointed by many lines to specify the type of tools needed and orders have already been placed for some of these. With others, such buying is with the idea of getting first options on equipment when it is available. Such reconversion planning has left the talking stage and entered the action stage. For example, one large Ohio company is now setting up for making bicycles.

• **AIRCRAFT OUTPUT**—Aircraft production for August was 7939 planes, only slightly below the July output of 8000. Last month's output was 3.5 per cent below the scheduled August production of 8228 planes, according to WPB officials. The officials attributed this slight reduction to the decision of the Government to make formal acceptance of planes only after modifications for combat duty have been made. WPB recently announced a program of cutbacks in aircraft production because of declining military requirements. A cutback of five per cent is scheduled for the last five months of 1944, nine per cent for the first half of 1945 and 15 per cent for the latter half of 1945. The final defeat of Germany will undoubtedly result in further schedule reductions, WPB officials said, but until that time, deliveries must be kept up to schedule to make up the large invasion losses, given out by Gen. Dwight D. Eisenhower recently as 3000 planes since "D" Day.

• **FARM MACHINERY**—The total value of farm machinery and equipment produced during July, 1944, was $73,595,553. This was 51.2 per cent higher than the average of the 12 preceding months. July production in 15 of the 21 machine groups exceeded average production during the preceding 12 months, while 6 fell below. This total exceeds June production by $7,918,182, but it still leaves the program 3.6 per cent behind schedule. Exclusive of repair parts, production was 1.6 per cent behind schedule on July 31. These overall percentages fail to disclose the fact that many items are ahead of schedule and many others are considerably behind schedule. For example, the following classes of equipment are ahead of schedule: planting, seeding and fertilizing machinery; harrows, rollers, pulverizers and stalk cutters; cultivators and weeders; wheel type tractors; and irrigation equipment. The following classes of equipment are considerably behind schedule: harvesting machinery; garden tractors; farm pumps and windmills; and barns and barnyard equipment.

• **PLATE DECLINE**—Slowly but surely heavy plate requirements are easing. Apparently the peak in plate demand has been reached. July figures of the Iron and Steel Institute show plate shipments reached the lowest level of any month in this year. More indicative of the changing trend in plate shipments is seen in the relative position of plate shipments to total steel shipments. In January of this year plates constituted 20.6 per cent of total shipment, while in July they accounted for 19.1 per cent. The decline was small, but in view of more recent market data indicating forthcoming cuts in the Maritime demand, it is reasonably clear that the heavy pressure for plates will begin to be relieved.

• **STEEL CUTBACKS**—According to data gathered by THE IRON AGE, Washington Bureau, approximately 18,000,000 tons of finished steel annually are being devoted to nonmunition purposes. The proposed cutback when Germany is defeated will free an additional 20,000,000 tons for finished capacity. Possibly 12,000,000 tons of steel which is uncut and in inventory and will be available for civilian use but not all will be suitable for civilian needs. It is estimated that perhaps another 6,000,000 tons of steel will turn up as in process, but will be of little value except as scrap.



Steel Ingot Production by Districts and Per Cent of Capacity.

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
September 5	93.0	100.5	96.0	98.5*	94.5	104.5	91.0	92.0*	97.5*	88.5*	99.0	106.0	73.5	96.0
September 12	91.0	100.0	95.0	98.5	94.5	104.5	91.0	99.0	102.0	89.0	95.0	106.0	94.5	95.0

* Revised

WHEN IT CAME TO "EATIN' EQUIPMENT"

they turned to Stainless Steel

MERITS OF ALLEGHENY METAL

- ☆ Unaffected by any food or fruit acids.
- ☆ No staining, no tarnishing, no off-tastes.
- ☆ Lustrous, handsome, sanitary.
- ☆ Easy to form, weld, machine.
- ☆ Lowest maintenance and depreciation costs.

FOOD and stainless steel are two substances which get along well together. You can find ample evidence of that fact in the preparation and serving equipment of almost any hotel, hospital, restaurant, bar or soda fountain—and more recent evidence in the mess trays, flatware, stock pots, canteens, meat pans, field kitchens, portable refrigerators, etc., of the Armed Forces.

Food and beverages, after all, are chemicals—and Allegheny Metal, the pioneer stainless in this country, is a highly chemically-resistant material. It's bright, tough, close-textured and exceptionally strong. The sanitary factor is high, cleaning is easy, and life in service is exceptionally long. Those are properties, when you're thinking in terms of food, that look good from any angle.

If you have ideas and questions on food equipment—anywhere along the line, from processing to serving—we can fill in many of the answers. Allegheny Ludlum Steel Corporation, Pittsburgh, Pa., and other Principal Cities.

Allegheny Metal is also handled and stocked by all Joseph T. Ryerson & Son, Inc. warehouses.

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REMEMBER THE NAME TODAY FOR THE NEEDS OF TOMORROW

Current Scrap Market Situation Analyzed

By TOM CAMPBELL

New York

• • • **Having created a Frankenstein monstrosity** of details, rules, regulations and formulae for scrap control in wartimes, the OPA and the scrap fraternity are now trying to find a way to eradicate the monster when and if conditions warrant such action. For the past few weeks, OPA representatives have been sounding out various scrap brokers and dealers for their views concerning possible revision of the scrap price schedule.

Meanwhile, the scrap market for open hearth grades especially has become weaker and is definitely further off, pricewise, in New York and Philadelphia. Even in the locations where prices are considered nominal at the ceiling levels, there are no buyers and it is probable that there will be none until lower prices prevail.

A wide and significant crack in the scrap market appeared within the past week when a large consumer informed his sources of supply that he would no longer pay the same price for No. 1 steel, No. 2 steel and bundles. While this consumer agreed to accept shipments for completion of contracts outstanding, all new orders will be written with No. 1 heavy melting steel as the basic price, No. 2 heavy melting steel $1 below this, No. 2 bundles $2 a ton below No. 1 heavy melting and No. 3 bundles $4 a ton below No. 1 steel. This action was bound to come and further reflects not only the weakness in the scrap market but also the first concrete movement away from the hodgepodge of OPA rules, regulations, etc.

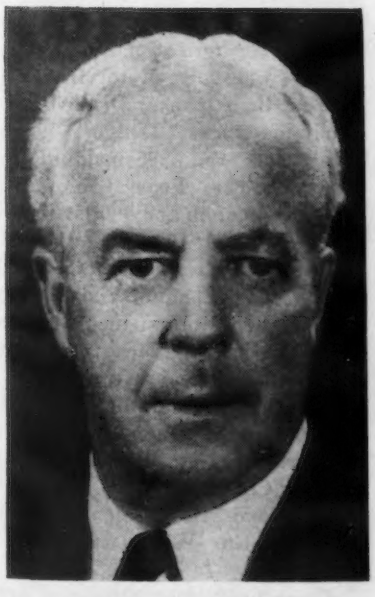
Many scrap brokers and dealers appear to be confused over the present status of the scrap market. Some think it is a definite barometer forecasting of an early defeat of Germany. Others take the view that it is a combination of weaknesses which began as long as six months ago. Looking back over the record of purchases during that period, some brokers now admit that buying has been slow, rigid specifications were set and that the OPA ceiling prices had the effect, for a while, of creating a superficial floor to scrap prices which has finally weakened and broken through in some spots because it had no practical support.

Strangely enough, cast scrap grades have not joined in the weakness exhibited by open hearth scrap. Yet, since they are a part of total scrap supplies, it is logical to expect an expansion in those small weaknesses for cast grades which have already appeared in Detroit and Birmingham.

Speculation within the scrap fraternity is rife over such questions as: 1—How much further will scrap decline? 2—What will be the bottom before there is a turn, and 3—How high will it go on the next upward rise providing controls are off? Brokers with long experience in the scrap market, after brushing up on their prewar knowledge of a free market are beginning to believe implicitly that the scrap market is now exhibiting its free tendencies and is on a definite downward trend.

While some brokers and dealers sprinkle their opinions with "if the war ends on Oct. 31 or if the war ends before Thanksgiving, etc." others hold the view that the market will become definitely weaker regardless of what happens abroad in the next few months. It is conceded that the market may rebound to the ceiling levels again but this, some brokers say, might be nothing more than a normal upward movement which often occurs during peacetime due to regular factors influencing the acquisition of scrap.

Since scrap controls were among the first to be placed in effect, there is speculation in Washington that they may become the first to be relaxed or abolished. Washington sentiment appears to coincide with the scrap industry's view that the whole set of controls should be abandoned



Batcheller Returns to WPB As Trouble Shooter

• • • Hiland G. Batcheller, president, Allegheny Ludlum Steel Corp., has returned to the War Production Board as vice chairman of operations. Thus, an original Nelson appointee, whose ability to get along with people and at the same time get things done, comes back to the fold which has been considerably "wrinkled" recently by inter-office politics. He replaces E. R. Boulware who has resigned as operations vice chairman. Mr. Batcheller first went to WPB in September, 1942, as director of the WPB Steel Division and later was appointed operations vice chairman of the WPB by Donald Nelson. He left this post in January, 1944, to return to Allegheny Ludlum after major tasks had been completed at Washington. Mr. Batcheller's flair for pouring oil on troubled water and his knowledge of not only industry but also WPB methods and actions as well were apparently enough to result in his being drafted to a job that holds not only headaches but heartaches as well. To all who know Mr. Batcheller his acceptance of this job represents a tremendous personal sacrifice. A trouble shooter as a general rule never has friends—*for long.*

just as soon as the necessity for them has passed. Meanwhile, it is understood that the scrap trade wants an immediate elimination of the mixed shipment clause which dictates that the price of the lowest priced grade dominates the mixed shipment and sets the price for the carload.

While scrap brokers, dealers, consumers and observers attempt to refresh their memory on the peacetime gyrations in the scrap market, the latter seems to be automatically working itself back to its former position of prominence in the iron and steel trade as a barometer confounder and "disturber of sleep."

Peak Delay on Deliveries Of Finished Steel Reached on June 1

By C. T. POST

Chicago

• • • **Review of delivery** situations quoted by local mills on key finished steel products on the first day of each of the past six months clearly indicates that the peak delay was reached about June 1. The current delivery pattern bears a close resemblance that was prevalent early this spring, with a median delivery for all listed products of five months.

The peak was eight months on June 1, at which time WPB was forced to reassure producers that the Controlled Materials Plan could overcome what appeared to be approaching chaos. Local comment by THE IRON AGE at that time noted that "Unbiased diagnosis of the situation lends further strength to the belief that the only sure cure would be a successful invasion of the European continent, engendering drastic cutbacks in currently plotted programs."

Reshuffling of flat rolled production directives soon brought some relief to local mills but not until aircraft steel buying was trimmed, shell containers cut back and shell steel requirements delayed did the down grade become apparent.

Flat rolled products, principally the narrower, lighter sheared plates and hot rolled sheets, have been the tightest items throughout the six-month period. The plate overload caused the greatest concern in early June when deliveries by some mills spread to ten months, the longest delay recorded by any product during the six-month period.

Redistribution of this peak load brought it into line with hot rolled sheets. Both items remain extended with seven to eight month deliveries being quoted.

Perhaps the most spectacular career, however, and the one which most clearly reflects buying trends of a particular industry, has been enjoyed by popular alloy bars. Following quotation of four month delivery on April 1 and May 1, this classification zoomed to nine months on June 1, following which it dropped sharply and steadily. Recently two-month delivery has been available on many items in this classification. The upsurge apparently bore some relationship to sudden increased emphasis on the heavy bomber program, and the dwindling seemed to follow the pattern of aircraft cutbacks, particularly the revised attitude toward spares. In fact, some second guessers might claim that the official cutback announcements were foreshadowed by the decline of this item.

Structural shapes have maintained the evenest level throughout the period, having close to a four to five month delivery period. The impact of the shell steel program on heavy structural and large size bar production is not reflected in delivery dates, possibly because the pressure from this source was offset by a smaller demand from other buyer classifications.

Most notable recent fluctuation recorded is the sharply improved delivery available on cold rolled sheets by some mills.

It is apparent that, with the exception of narrow plates and hot rolled sheets, the market would respond rapidly to a cutback of 35 or 40 per cent in extended requirements, making delivery within 60 to 75 days almost universal. Relief is expected on the plate situation through reduced Maritime Commission requirements, but the hot rolled sheet bracket probably will be more stable.

Number of Months Delivery Delay

PRODUCT	First of the Month					
	APRIL	MAY	JUNE	JULY	AUG.	SEPT.
Sheared plates, narrow	7	4–6	8–10	6	7	8
Sheared plates, wide	5	5	4	5	5	4
Univ. mill plates	6	6	6	5	5	5
Large structurals	4	4	5	4	5	5
Small structurals	5	5	6	4	5	5
Strip mill sheets	8	8	9	7	7	7
Strip	4–5	4–5	8	7	7	6
Carbon bars	5	7	7	7	7	6
Popular alloy bars	4	4	9	6	4	2–4
Hot rolled sheets	8	8	9	7	6	7
Cold rolled sheets	6	6	8	8	7	4
Median	5	5	8	6	6	5

High Level Truck Output To Continue Well Into 1945

Detroit

• • • **Confirmation** that the heavy volume of motor truck production for civilian use will continue well into 1945 is contained in a recent announcement by the WPB automotive division of first quarter production quotas of trucks, truck-trailers for highways and off-the-highway use.

National quotas contemplate the construction of 39,512 medium, 15,677 heavy, and 373 off-the-highway vehicles. Authorizations in this district include Chevrolet Motor Division, 13,522 medium trucks; Divco Corp., 428 medium trucks; Dodge Division of Chrysler Corp., 3895 medium and 390 heavy trucks; Federal Motor Truck Co., 270 medium and 480 heavy trucks; Ford Motor Co., 11,464 medium trucks; General Motors Truck & Coach, 2166 medium and 2209 heavy trucks; Reo Motors, Inc., 945 medium and 105 heavy trucks; and Duplex Truck Co., 16 heavy trucks.

For the first half of 1945, the following truck trailer production was allotted in this district: Fruehauf Trailer Co., 59 low bed heavy hauler trailers and 116 petroleum tank trailers; and Gar Wood, four milk tank trailers.

These production schedules are exclusive of military requirements.

Shipbuilding Continues To Take Largest Part of Steel Shipments

New York

• • • Practically one-fifth of the nation's total steel shipments were sent to shipbuilders during the first six months of this year, just as during the entire year 1943, according to the American Iron and Steel Institute.

Far and away the nation's largest wartime consumer of steel, merchant and naval ship construction required 19.4 per cent of the total steel shipped in the first half of this year. During 1943 shipbuilders received 19.2 per cent of all steel shipped, and in 1942 they got 15.6 per cent.

Of 30,677,000 tons of steel shipped in the first half of this year, 5,946,000 tons went to shipyards. Last year the yards received 11,509,000 tons out of 59,906,000 tons shipped in the full year, and in 1942, when shipyards first took rank as the number one consumer of steel, they received 9,440,000 tons of steel.

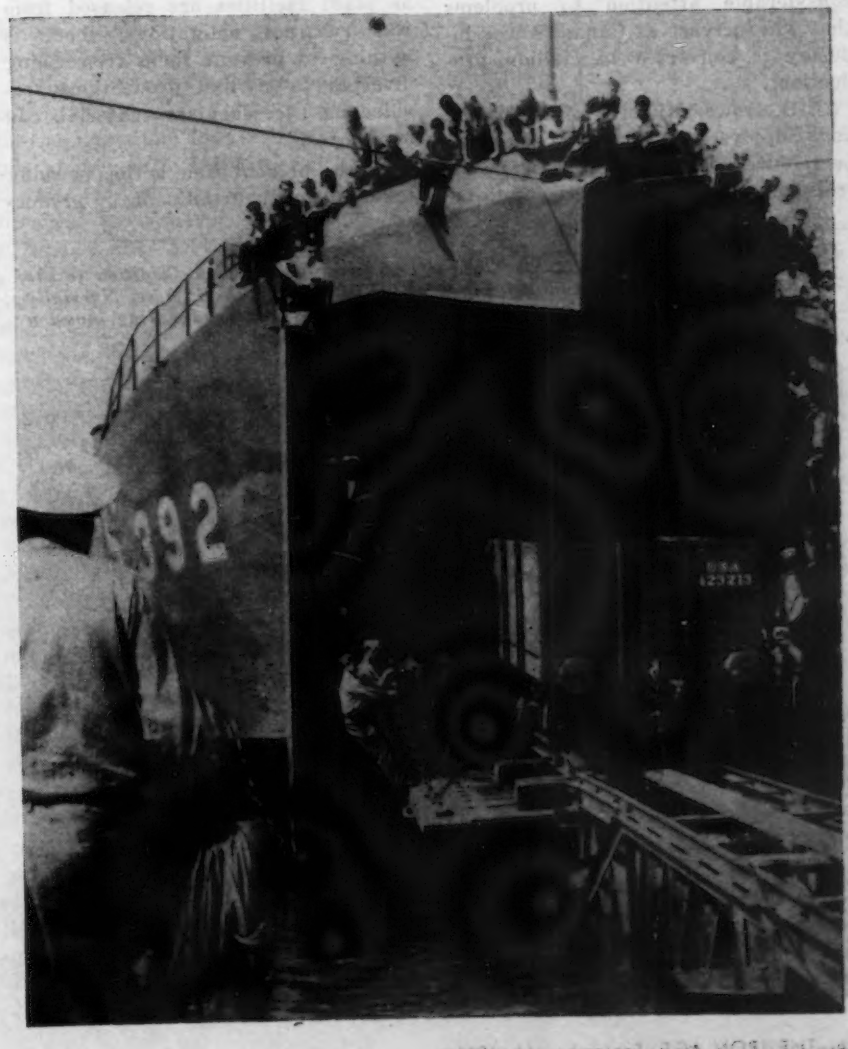
According to the figures covering steel shipments for the first six months of this year, more steel has been going to the railroad industry classification than was the case last year. This industry received 2,887,000 tons, or 9.4 per cent of the total steel shipped during the first half of 1944, compared with 7.6 per cent of the total last year.

Jobbers, dealers and distributors received 3,785,000 tons or 12.3 per cent of the total shipments in the first half of this year. This compares with 11.3 per cent in the entire year 1943.

Other industry groups rated as follows during the first six months of this year: Construction industry, 2,139,000 tons, 7 per cent; pressing, forming and stamping, 1,427,000 tons, 4.7 per cent; container industry, 1,845,000 tons, 6 per cent; agricultural equipment, 529,500 tons, 1.7 per cent; automotive and aircraft, 1,081,000 tons, 3.5 per cent; oil, natural gas and mining, 784,000 tons, 2.6 per cent; machinery and tools, 1,216,000 tons, 4 per cent; miscellaneous, 6,196,000 tons, 20.1 per cent; steel converting and processing, 2,839,000 tons, 9.3 per cent.

STEEL SHIPMENTS BY CONSUMING INDUSTRIES Source: American Iron and Steel Institute	Net Tons First Six Months 1944
1—Steel Converting and Processing Industries	
(a) Wire drawers and wire product mfrs.	326,017
(b) Bolt, nut, and rivet manufacturers	586,343
(c) Forging manufacturers	
(1) Automotive and Aircraft	325,372
(2) All other	803,294
(d) All other steel plants and founderies	798,252
Total	2,839,278
2—Jobbers, Dealers and Distributors	
(a) Oil and natural gas industry	240,482
(b) All other	3,544,621
Total	3,785,103
3—Construction Industry	
(a) Public (Municipal, State, National)	31,066
(b) Highways	73,153
(c) Railways	39,809
(d) Automotive and Aircraft	62,170
(e) Utilities	97,625
(f) Bldg. trim, accessories and builders' hardware	205,540
(g) All other	1,629,316
Total	2,138,679
4—Shipbuilding Industry	5,945,880
5—Pressing, Forming and Stamping Industry	
(a) Metal furniture and office equipment	66,938
(b) Hardware and household equipment	165,830
(c) Automotive	646,487
(d) All other	548,227
Total	1,427,482
6—Container Industry	
(a) Oil and natural gas industry	210,947
(b) All other	1,634,482
Total	1,845,429
7—Agricultural, including Implement and Equipment Manufacturers	529,503
Total	
8—Machinery and Tools	
(a) Machinery and tools, not incl. elect. equip.	831,809
(b) Electrical machinery and equipment	384,470
Total	1,216,279
9—Automotive and Aircraft Industry	1,081,404
10—Railroad Industry	
(a) All railroads	2,026,549
(b) Car and loco. builders and parts mfrs.	860,628
Total	2,887,177
11—Oil, Natural quarrying and lumbering	111,551
(a) Oil and Mining, Total	784,391
12—Miscellaneous Industries and Export	6,196,105
13— Total (Items 1 to 12)	30,686,710

SURPRISE! *When those LST swinging doors are opened, you can expect almost anything to emerge. Here, a freight car, no less, makes its exit at Cherbourg harbor, France. A specially constructed ramp was used to get the car onto the beach.*



Canada Directs Attention To Industry Swing from War to Peace

Toronto

• • • **With the possibility** of early termination of hostilities on the European battlefronts, Canadian Government officials are now giving special attention to the swing of industry from war to peacetime channels. According to word from Ottawa, the huge task of reconversion of Canadian industry to peace will be in full swing by the end of the year. Unoffiical estimates are that once Germany capitulates, Canadian industrial war production will soon be reduced by at least 50 per cent. This will mean that labor and materials in large volume will be released for production of civilian goods. It is believed that from 300,000 to 350,000 war workers soon after the German surrender will be made available for normal peace production.

Consideration also is being given to relaxing of wartime controls and officials of the Department of Munitions and Supply now are giving considerable attention to problems that will increase as Canada's war industry is converted to civilian production.

C. D. Howe, Minister of Munitions and Supply, said that the policy to be followed on relaxing wartime controls might be clarified in a statement to be made in the near future. Other sources pointed out that with only 24 per cent of the war production going to Canadian Armed Forces, and with 76 per cent under contract to other United Nations, the question of how busy Canadian plants will be on war work after the collapse of Germany rests largely with other countries. So far there has been no indication of the extent of Canada's 1945 war production schedules, but it is expected that while production may be continued at a high level in some lines, it will be slowed down in others. Meantime, steps are being taken to ease the transformation from war to peace production. Mr. Howe stated "the only controls that we are now exercising are those arising out of scarcity of some critical materials. Controls of this type on aluminum already have been removed and similar action is planned with regard to other materials when they no longer are required for war needs. As soon as plant facilities are released from war contract obligations, there is nothing to prevent them from being diverted to civilian production, provided the necessary raw materials can be secured."

At the present time action is being taken toward curtailment in production of small arms and small arms ammunition. Production of trainer aircraft also has been slowed down, and it is stated that another important program which will be cut in half next year is the production of radio and signals communication equipment. It is stated that plans now are being made to permit the latter industry to resume civilian production to take up the slack which is almost certain to come in a few months' time. Already there have been heavy lay-offs of labor in the industries referred to above but a large part of these workers have been absorbed by companies in other branches.

The Department of Munitions and Supply announced that in order to meet the labor needs for heavy ammunition which is in increasing demand and because reserves for small arms ammunition are adequate, the staffs of the Small Arms Ammunition Plant will be reduced by approximately 3500 workers. Officers of National Selective Service are making arrangements for an orderly transfer of the Small Arms Ammunition workers. Those laid off are said to be urgently needed at Cherrier and other Montreal plants producing heavy artillery shells. The three plants that are affected by the lay-off are operated by Defence Industries Limited, being the Westmount and Verdun plants and the Montreal Works. By the end of December it is estimated that all operations at the Montreal Works and the Westmount Tool Works will be terminated. The Verdun plant, however, will continue to produce but on a considerably lower scale.

NEW BRITISH FIGHTER: *A Seafire III, newest fighter plane addition to the British Navy, stands with its wings folded at an English air base. Normally operating from escort aircraft carriers, the fighter was used during invasion of France.*

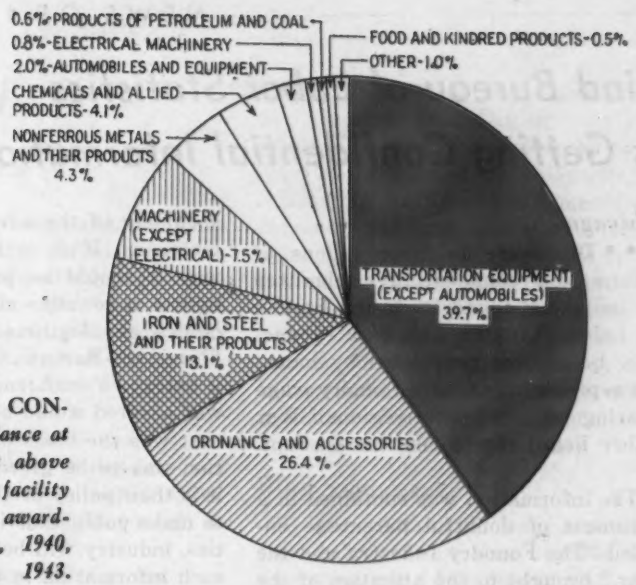
Homestead Mill Adds Turn

Pittsburgh

• • • **While an additional** turn was added to the working forces at the Carnegie-Illinois 160-in. plate mill at Homestead, production of plates there is not yet near capacity. The addition of the turn brings the working schedule to only two turns a day. Previously, the mill had been operating on a single turn basis, awaiting the installation of certain equipment in the finishing line. With the installation of this equipment the addition of a turn was made.

According to company officials, however, maximum production from the two turns will not be possible for some time yet, as operational and mechanical difficulties slow up output at the shear lines. Until these bugs are ironed out, there is not expected to be maximum production or any substantial increase in plate output.

Chicago Federal Reserve Reports Extent of Industry Plant Conversion


0.6%-PRODUCTS OF PETROLEUM AND COAL
0.8%-ELECTRICAL MACHINERY
2.0%-AUTOMOBILES AND EQUIPMENT
CHEMICALS AND ALLIED PRODUCTS-4.1%
NONFERROUS METALS AND THEIR PRODUCTS 4.3%
MACHINERY (EXCEPT ELECTRICAL)-7.5%
IRON AND STEEL AND THEIR PRODUCTS 13.1%
ORDNANCE AND ACCESSORIES 26.4%
TRANSPORTATION EQUIPMENT (EXCEPT AUTOMOBILES) 39.7%
FOOD AND KINDRED PRODUCTS-0.5%
OTHER-1.0%

FACILITY CONTRACTS: *A glance at the color chart above shows how facility contracts were awarded from June, 1940, through Sept., 1943. Although general conversion of the Seventh Districts plants, which include Detroit and Chicago, did not get fully underway until after Pearl Harbor, conversion was very extensive in 1942, probably as far-reaching as anywhere in the nation. Despite the fact that very few new facilities were completed by the close of 1942 (less than 8 per cent of the district's total), at the close of the fourth quarter of 1944, more than 90 per cent of the district's planned industrial expansion will have been completed.*

Chicago

• • • Nearly two-thirds of the more than $4 billion spent for wartime industrial facilities in the Midwest was spent for equipment, and one-third for structure, the Federal Reserve Bank of Chicago reports in a survey depicting the extent of industrial plant conversion and the importance of prewar manufacturing establishments in this area.

In 1939 industrial plants in the seventh federal reserve district, which comprises most of Illinois, Indiana, Wisconsin and Michigan, and all of Iowa, produced nearly one-fourth of the nation's total value of manufactured products. The district had roughly the same proportion of total prewar industrial facilities, amounting to an estimated value of from $12 to $14 billion. Michigan and Illinois, the largest peacetime industrial states, have had approximately 70 per cent of the expansion in new plants and equipment. However, the war has brought a greater geographical diversification to this section than to other parts of the country. Twenty-six manufacturing communities in the seventh district are designated as industrial areas by WPB, compared with four recognized by the Bureau of the Census in 1939; the national total has risen from 33 to 113 such areas. Although the concentration of total value of products in these 26 areas is about the same as in 1939, it is intimated that the postwar significance of many of the more remote areas is limited by their association with ordnance and chemical-powder plants.

The Federal Reserve shows graphically the extent to which the Midwest is a Johnny-come-lately to the war party. Very few new facilities here were completed by the close of 1942, the expansion at that time amounting to less than 8 per cent of the district's present total compared with nearly 60 per cent completed for the nation.

The peak of new facility installations in the nation was reached in the third quarter of 1942 while in the Seventh District it was a year later, the Bank states.

"Ninety per cent of the nation's scheduled expansion was in place by the beginning of 1944, while the district lagged with only 63 per cent. As the tempo of industrial facility expansion has slowed down in the nation as a whole, the Seventh District has gradually caught up in facility completions so that at the close of the third quarter of 1944 the district will have completed more than 90 per cent of its planned industrial expansion, compared with over 95 per cent in use nationally."

This construction lag behind the rest of the country has had serious repercussions in recruiting manpower for the new plants (see IRON AGE, Aug. 17, 1944, page 111).

Strongly influenced by the availability of facilities for civilian automobile manufacture, principally in the Detroit area, the growth of manufacture of aircraft and parts has been the most important single item in the shift in product makeup. Second in rank is ordnance, which grew from practically nothing in 1939 to second rank among industry groups at the present time. The Detroit and Chicago area account for 55 per cent of the aircraft expansion and 34 per cent of the ordnance facility expansion, Detroit leading in both categories. New plants to produce iron and steel and their products are centered largely in Gary-Hammond 41 per cent, and Chicago 35 per cent.

Almost 92 per cent of the facility expansion for aircraft and more than 90 per cent for ordnance in the district have been financed with public funds.

The survey reveals figures which show that by May, 1944, DPC had financed 43 per cent of all government financed plant and equipment expansion in the nation. The proportion of public funds advanced by the Army was 32 per cent; the Navy 20 per cent; Maritime Commission 3 per cent; and other government agencies 2 per cent.

More than 80 per cent of the new industrial facilities constructed and installed since 1940 in the Seventh District and about 70 per cent in the nation as a whole were financed with public funds. In the smaller industrial areas, over 90 per cent of the facility expansion since 1940 was publicly financed, and in Detroit and Chicago approximately 80 per cent. Private funds have exceeded public funds in wartime expenditures for facilities in only three of the district's 26 industrial areas, according to the survey. These are Cedar Rapids, 30 per cent; Elgin, 56 per cent, and Peoria, 86 per cent.

Find Bureau of Labor Statistics Is Getting Confidential Information

Chicago

• • • **Disclosure to labor** unions of information confidentially submitted by individual foundries to the Bureau of Labor Statistics and War Production Board was postulated by industry representatives at a foundry wage hearing of the sixth regional War Labor Board rate committee on Sept. 5.

The information was contained in a document of doubtful parentage entitled "The Foundry Industry and the War," brought to the attention of the committee by George Gratz, attorney for the International Moulders and Foundry Workers Union of America. Gratz identified the mimeographed leaflet as having been prepared by WPB in May, 1944, and submitted and referred to it as such.

William J. Grede, Grede Foundries, Inc., of Wisconsin, challenged this assertion stating, "I cannot find an identifying mark to show it was ever prepared by officers of WPB, not even an indication to show who prepared it if it was prepared by a staff member. Inquiry at Washington reveals members of WPB disclaim any knowledge of it.

"The prejudicial way in which statistics are used to draw erroneous conclusions makes it appear as an official document of the advocates of a wage increase. If it is that, that is the way it should be presented. If the figures it contains about specific companies are legitimate and from the files of the Bureau of Labor Statistics, it betrays a confidence which industry was assured would be maintained and that was the basis on which information was to be given to the BLS. If it is their policy or the policy of WPB to make public individual plant statistics, industry will be reluctant to give such information in the future."

Gratz, the labor attorney, in first referring to the document, described it as being in the files of the WLB committee. An industry representative immediately inquired how it could have found its way into WLB committee files without having been introduced as evidence. Gratz later testified that the leaflet had been handed by C. C. Murphy, labor division official of the regional WPB, to a committee statistician immediately before the hearing. Gratz said that Murphy had given him another copy.

This brought an industry query as to the propriety of WLB accepting evidence by the back door and of a WPB official releasing confidential information to the union attorney. It was pointed out that the industry had had no chance to examine the document, even though the union had represented it as being of official origin.

The purpose of the hearing, which faded following the inference that WPB was funneling confidences to the union, was to "explore the possibilities that an unsatisfactory wage situation is contributing to the foundry bottleneck." The national WLB recently termed foundries "the number one bottleneck in war production" and instructed regional boards to give special consideration to wage problems in this industry.

The committee now will consider setting stabilized wage rates for the foundry industry in the six state region of Illinois, Indiana, Wisconsin, Minnesota, North Dakota, and South Dakota, or of revising rates already set.

Labor representatives contended an unsatisfactory wage structure definitely is a strong factor contributing to the foundry labor shortage. AFL testimony supported a ten cent increase across the board in the present stabilized rates. The CIO proposed that a common labor rate of 95c. an hr. be made the basis of a new wage structure. Chicago foundries recently were given an increase from 74 to 78c. an hr. in starting common labor rate.

Industry testimony scoffed at any possible influx of new employees to be derived from a general increase. The present wage structure is in harmony with going rates for comparable work it was said. If adjustments were necessary in small geographical labor areas they should be made on that basis rather than on a state or regional basis it was declared.

The verbal scuffle over the mystery document was not the first intimation of bias in consideration of the matter. A large group of management representatives had claimed that they had received insufficient notice as to the time and purpose of the hearing held the previous week. This led to a continuance to last week.

A committee report is expected about Oct. 1.

WRECKAGE OF WAR: *French civilians look over acres of wrecked Nazi equipment left behind on the banks of the Seine. The Nazis lost little time in getting out when the Allies moved in to liberate Rouen, France.*

CORRECTION

• • • **In the Aug. 31** issue of THE IRON AGE, it was stated in error that Edward G. Hardig had been made vice-president in charge of sales and a director of the National Tube Co., Cleveland. Mr. Hardig is with the National Tool Co., Cleveland, O.

Colmer Committee Offers Broad Report on Reconversion Problems

Washington

• • • **The Colmer (House) Postwar** Committee recently submitted a broad report estimating the problems of reconversion and recommending courses of action to be followed by industry and government in meeting them.

The committee found that there are both deflationary and inflationary trends which might necessitate stimulative or depressive economic actions by the government, depending upon how things turn out.

Problems listed by the committee are:

Taxes

1. The necessity of taxing each family of four $550 a year to raise $20,000,000,000 to be spent by the federal government, in maintaining a strong military department, providing adequate care for veterans, and servicing a national debt of nearly $300,000,000,000

In addition the average family will be required to pay $350 to the respective state, raising the total tax to $900.

2. Taxes on corporations, and individuals in the lower and middle income tax bracket are too high.

Employment

1. To provide full employment, there will have to be provided 8,000,000 to 10,000,000 jobs more than there were in 1940. There will be 60,000,000 in the labor force after the war including 8,000,000 to 9,000,000 veterans.

To fill the bill there will have to be an increase of 6,000,000 to 7,000,000 new civilian jobs annually. The greatest prior peacetime increase averaged about 4,000,000 new jobs.

2. While approximately 4,000,000 to 5,000,000 temporary workers are withdrawing from the labor force 1,000,000 to 2,000,000 are coming of working age.

3. There are 18,000,000 civilian workers in war production and 6,00,000 in direct munitions production. The majority will have to change jobs.

4. The increase in overtime in war work has added the equivalent of 5,000,000 workers on a 40 hr. week.

5. If demobilization proceeds promptly the number of temporarily unemployed may reach a peak of 5,000,000, and an even greater number if production does not expand rapidly during the transition period.

Slowness in reconversion may make the duration of unemployment extend beyond the unemployment compensation period provided by state laws.

Financial

1. The total volume of money now available in the form of deposits and currency approximately $130,000,000,000 as compared to $60,000,000,000 in 1939.

2. Liquid savings during the war by individuals has doubled during the past there years to $117,000,000,000 from $55,000,000,000. Savings may reach $150,000,000,000.

3. In addition to the increase in the holdings of currency, bank deposits, and government bonds, individuals have increased their participation in insurance and pension reserves, excluding social security, by about $10,000,000,000. They have also retired outstanding indebtedness by some $5,000,000,000.

4. About $25,000,000,000 of savings represents deferred demand for consumer durable goods not purchaseable during wartime.

5. Corporations have increased their assets 157 per cent from December, 1940, to December, 1943.

6. The Federal Reserve Banking Act says that the Reserve banks shall have reserves of gold certificates equal to at least 40 per cent of their Federal Reserve notes in circulation, and reserves consisting of gold certificates or lawful money equal to at least 35 per cent of their deposits.

Growing wartime requirements for currency and credit have encroached upon its surplus reserves built up by the system in the past 20 years. Although there is still an excess of nearly 30 per cent above actual requirements, financial experts say that a continuation of the recent trend would wipe out the surplus sometime in the latter part of next year.

War Surplusage

1. The output of war munitions from July 1, 1940, to June 30, 1944, was approximately $130,000,000,000, but nobody knows how much will be left over upon the defeat of Germany and Japan.

2. The Committee says the most reliable estimates range from $50,000,000,000 to $60,000,000,000, but that only $15,000,000,000 will be available for sale in clothing, textiles and other soft goods; motor vehicles; stockpiles of raw materials, machinery, tools and equipment.

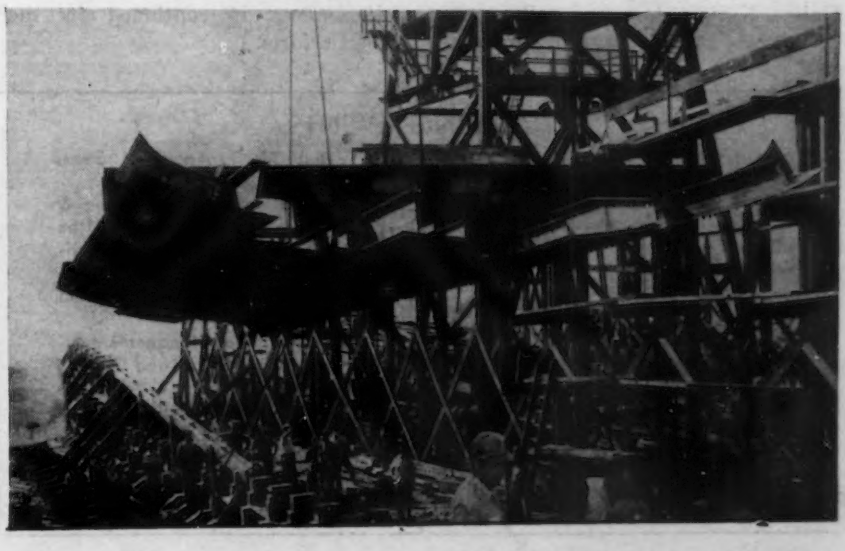
Of this $15,000,000,000, it is estimated that only $6,000,000,000 will be sold domestically, with the remainder sold abroad.

3. An additional $15,000,000,000 in government owned plants will be surplus and up for sale.

4. Approximately 20,000,000 to 25,000,000 deadweight tons of shipping may be surplus, depending upon whether the present Maritime program for 1945 is completed.

The Maritime Commission has esti-

LOWER AWAY: *The first of the new "Pocket cruiser" type destroyer is lowered into place in U. S. Steel's Federal shipyard at Port Newark, N. J. This vessel will be no longer than those built in Federal's Kearny yard, now devoted to building troopships.*



mated peacetime needs in shipping to be somewhere between 15,000,000 and 20,000,000 tons if the United States has an extensive foreign trade. An estimated 50,000,000 tons of shipping may be owned by the government at the end of the war.

Foreign Trade

1. Exports fell from $5,200,000,000 in 1929 to $2,100,000,000 in 1934 and never reached above $3,300,000,000 until the present war period. Imports fell from $4,400,000,000 in 1929 to an average of $1,700,000,000 a year for the period 1941-35, and were less than $2,300,000,000 in 1939.

2. The foreign trade position of the United States for the 10 years following World War I was that of the world's largest exporter and second largest importer.

3. Imports are not now limited by lack of demand or ability to pay, but by the loss of former sources of supply and shipping space.

4. Exports are not dimited by a shortage of dollar exchange, but by productive capacity and shipping space. Most export is Lend-Lease.

5. Western hemisphere countries are now supplying the United States far more in value than can be allocated or shipped in return. As a result, these countries are building up large gold and dollar exchange reserves which can be used to purchase goods from the United States.

6. Prewar nature of trade now changed by the following influences:

a. The destruction of industrial equipment, mines, crops, and homes in the battle areas which will require replacement.

b. The mounting need for war and postwar relief to populations in the devastated areas.

c. The changing in social ideals and the announced intention of the United Nations to assure all peoples the highest standard of living possible.

d. The deferred normal demands for goods in all countries.

e. The development of new productive capacity and natural resources in many regions due to the war demands.

f. Vast changes in creditor-debtor relation among nations.

g. A much wider acquaintance of foreign peoples with American goods.

h. Shipping facilities at the end of the war which will be far beyond the normal needs of peacetime.

7. The financial obligations of World War I and II have to be settled.

Contract Termination

1. Prospective complications and delays between stoppage of the flow of war production, and the resumption of other work.

2. The need for speedy conclusive settlements, protection of the government against fraud, uniformity of policy, and prompt removal and storage of war inventories and machinery.

Removal of Controls

The committee's recommendations for solution of these problems are:

The expansion of the functions of the Office of War Mobilization to include responsibility for reconversion in an effort to coordinate all government action under central policy guidance. OWMR would then have jurisdiction over the Office of Contract Settlement, the Surplus War Property Administration, and the Retraining and Reemployment Administration.

Other war agencies should be revamped, merged, and some should be abolished. The Army and Navy should have nothing to do with reconversion because they are "unsuitable" and may even "hamper" the postwar adjustments if continued in their present form.

While existing controls over manpower, prices, wages and production should be discontinued as soon as possible to let business do the job of reconverting as soon as possible, the committee said that some controls should be maintained through the conversion period to prevent inflation or depression.

"The situation is volatile," the report added. "Experts have ventured opinions as to the nearby economic outlook that range all the way from one of these extremes to the other.

"It is extremely difficult, if not impossible to foretell what degrees of inflationary pressure may develop in this transition period. Much depends on the suddenness with which the war will end, the rate at which war expenditures taper off, the handling of contract termination, the rate of release of materials for civilian production, and demobilization of the armed forces.

The committee suggested numerous revisions of tax structure intended to stimulate investment and production. It observed that it should be possible to reduce taxes in the aggregate below the extreme wartime levels.

The report said: "Consideration should be given specifically to the relief of those tax burdens which bear heaviest upon the lower and middle income groups, and which penalize the enterprising businesses to which we must look for a large share of the funds for expansion of employment opportunities."

Release of liquid savings may be inflationary, so OPA ceilings and consumer credit restrictions should be continued, the report declared. The reverse treatment should be given if it appears necessary to expand the volume of both private and public credit.

The committee suggested the removal or reduction of the various types of international trade restrictions (protective tariffs, currency manipulations, and trade discriminations) is essential; that possible revisions of the merchant marine laws may be needed to maintain commercial use of the vast fleet built which has been built during the war.

The expansion of private construction was urged, and planning for public works should be given a green light to prevent unemployment.

Unemployment compensation administered by the states, but assisted by the government should be increased in amount for a longer duration, and should cover broader segments of workers.

COMING EVENTS

Sept. 25-27—Association of Iron and Steel Engineers, Pittsburgh.
Oct. 5-7—SAE National aircraft engineering & production meeting, Los Angeles.
Oct. 5-7—National Electronics Conference, Chicago.
Oct. 5-6—AIME Electric furnace steel conference, Pittsburgh.
Oct. 10-11—Gray Iron Founders' Society, Inc., Cincinnati.
Oct. 12-14—The Electrochemical Society, Inc., Buffalo.
Oct. 16-20—National Metal Congress, Cleveland.
American Society for Metals.
American Welding Society.
Society for Experimental Stress Analysis.
American Institute of Mining & Metallurgical Engineers, Iron and Steel Division and Institute of Metals Division.
American Industrial Radium and X-Ray Society.
Nov. 2-3—Industrial Management Society, National Time and Motion Study Clinic, Chicago.
Nov. 27-Dec. 2—National Exposition of Power and Mechanical Engineering, New York.
Dec. 4-6—SAE National air cargo meeting, Chicago.

OPA May Provide Price Increases For Civilian Goods Not Now Produced

Washington

• • • **OPA may soon provide** maximum percentage price increases on civilian goods not now produced to take care of increased material and labor costs since 1941 and to forestall an administrative breakdown caused by the possibility of several hundred thousand concerns applying for new individual ceilings.

This was announced by War Mobilizer James F. Byrnes, on Sept. 9, in a demobilization report to President Roosevelt on future policies to be followed with respect to military inventories, wages and hours, prices, production and manpower controls, cutbacks, taxes, contract termination, surpluses, and plant clearance.

Hereafter, the report said, Lieut. Gen. Brehon B. Somervell will purchase for strategic reserve 50 per cent as much as previously, and will reduce depot stocks levels 33 1/3 per cent in future buying. Strategic reserve embraces supplies for an additional 1,000,000 men for a certain period.

This action was approved by Army Chief of Staff General George Marshall, and it is believed it was taken because of the transmittal of a suppressed production report last month to the Joint Chiefs of Staff by WPB Chairman Donald M. Nelson. The report pointed out excesses in certain munitions, and Mr. Nelson requested its review by the Joint Chiefs so that certain programs could be cut back if it was discovered that the report is correct.

Mr. Byrnes recommended the return to a 40 hr. work week in converting industry to civilian production after the fall of Germany, to spread employment. He said he thought this move would help check migration of workers from war industries to civilian industries because of the pay incentive in war industries.

Under the new price policy, it will be up to OPA to adjust prices found too low or too high, Mr. Byrnes said.

The War Mobilizer stated:

"Since Jan. 1, 1941, when the production of civilian durable goods was drastically curtailed, industrial wholesale prices have increased. Often it is difficult to ascertain quickly the amount of such increase because the increase has not been uniform for all commodities.

"Some commodities have risen substantially, while others have declined or not risen at all. For example, iron and steel prices have not risen, and the price of aluminum actually has declined. There has been very considerable technological progress during the war which should serve in some cases to offset increases in labor and material costs.

"However, it should be feasible for OPA to establish a general ceiling for articles out of civilian production for some time at a fixed percentage above the prices charged for such articles before civilian production ceased. This percentage can be quickly computed on the basis of increased material, labor and other costs.

"Provision can be made to take care of hardship cases on appeal. As manufacturers return to production, competition should cause some prices to drop quickly and substantially."

OPA Administrator Chester Bowles and Economic Stabilizer Fred Vinson are working on the formula, which Mr. Byrnes said cannot now be announced. No hard and fast rule can be applied to all industries but a price program is being worked out that will make certain that the reconversion to civilian production in any industry will not be delayed by lack of information on prices, the report declared.

Manpower controls may not be relaxed on X-Day in very tight labor areas. This would include, it is assumed, the West Coast, and possibly other areas now classified Group I by the War Manpower Commission.

Detroit will not fall in this classification, it was learned, because special effort is being made to enable the automobile manufacturers to make passenger cars at the earliest possible time.

Other modifications of the promise made by WPB Acting-Chairman J. A. Krug that controls over production would be abolished except a simple priority system for the Army and Navy were contained in the report.

For instance, a system of preference ratings lower than those provided for the Military has been established to insure that utilities and other essential civilian industries get first call on materials and components.

"It is not anticipated that this rating band will be necessary and it will be used only in the event programs in this category fail to meet schedules," the report says.

Mr. Byrnes comes out in favor of abolishing the wartime excess profits tax after the defeat of both Germany and Japan. The rest of the report dealing with contract termination, plant clearance, and surpluses reiterates policy already announced.

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LABOR CONTRIBUTION: *Naval officers stand in a line of nearly completed air borne torpedoes produced by workers at "Torpedo Town," the name given the Amertorp Corp. plant at Forest Park, Ill. Each torpedo has 5000 parts.*

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Downward Trend in Plate Shipments Seen in Latest Reports

New York

• • • Ever so slightly has plate output dropped since the first of the year in per cent of total steel shipments, records of the American Iron and Steel Institute disclose. In July, plate shipments reached the lowest tonnage in any month of this year. Shipments of plate in July amounted to 969,000 net tons when allowance was made for inter-industry shipments.

In January of this year plates constituted 20.6 per cent of total steel shipments whereas in July they accounted for 19.1 per cent. While this drop in participation was slight it is expected in the trade that the trend will continue, especially since cuts are looked for in the Maritime Commission's plate needs by the first of next year.

Sheet tonnage in July was down slightly from June but the participation of sheet tonnage to total finished steel changed but little despite the drop in the plate position. Sheets in July accounted for about 15 per cent of total steel shipped while in January of this year the relative position of this product was 14.5 per cent.

Tin mill product shipments in July were down slightly from June but shipments of these products in July were 5.8 per cent of total steel shipments compared with 4.7 per cent in January. However, this slight rise, percentagewise, was due to the seasonal nature of tinplate shipments. Other steel product shipments were changed but little in July on a relative basis. Shipments for July were down about 80,000 tons for June.

American Iron and Steel Institute Capacity, Production and Shipments

STEEL PRODUCTS	Number of Companies	Items	Maximum Annual Capacity, Net Tons	JULY, 1944				TO DATE THIS YEAR			
				Production		Shipments (Net Tons)		Production		Shipments (Net Tons)	
				Net Tons	Per Cent of Capacity	Total	To Members of the Industry for Conversion into Further Finished Products	Net Tons	Per Cent of Capacity	Total	To Members of the Industry for Conversion into Further Finished Products
Ingots, blooms, billets, tube rounds, sheet and tin bars, etc.	47	1				726,429	222,778			5,003,478	1,576,296
Structural shapes (heavy)	10	2	8,977,450	302,873	40.9	299,815		2,331,797	45.4	2,279,321	
Steel piling	4	3		7,363		8,455		41,154		41,732	
Plates (sheared and universal)	23	4	16,021,220	1,055,204	77.9	1,036,769	67,665	8,010,244	85.9	7,797,026	368,788
Skelp	6	5				59,201	47,810			486,046	379,668
Rails—Standard (over 60 lbs.)	4	6	3,625,000	180,277	58.8	184,509		1,335,936	63.3	1,333,394	
—All other	6	7	518,600	21,981	50.1	16,340		113,984	37.8	114,283	
Splice bars and tie plates	13	8	1,743,500	62,955	42.7	66,807		473,047	46.6	486,053	
Track spikes	10	9	350,640	11,186	37.7	11,838		85,587	41.9	91,413	
Hot Rolled Bars—Carbon	37	10		709,053		573,023	75,426	5,080,609		4,234,393	542,623
—Reinforcing—New billet	15	11		39,484		44,723		268,317		285,033	
—Rerolled	15	12		4,883		5,589		48,746		54,080	
—Alloy	23	13		213,323		167,210	31,413	1,818,334		1,332,671	262,211
—Total	46	14	21,170,110	966,743	54.0	790,545	106,839	7,216,006	58.6	5,906,177	804,834
Cold Finished Bars—Carbon	24	15		139,672		137,802		1,045,062		1,040,319	
—Alloy	22	16		30,189		27,816		242,787		216,659	
—Total	30	17	2,711,650	169,861	74.1	165,618		1,287,849	81.6	1,256,978	
Tool steel bars	17	18	214,970	10,674	58.7	10,817		83,092	66.4	79,968	
Pipe and Tubes—Butt weld	16	19	2,289,130	109,804	56.4	115,387		823,974	61.8	823,070	
—Lap weld	8	20	967,900	41,531	50.8	42,184		338,220	60.0	337,763	
—Electric weld	9	21	1,225,170	78,462	75.8	77,415		469,902	65.9	465,445	
—Seamless	15	22	2,625,250	188,978	85.1	206,422		1,365,095	89.3	1,373,449	
—Conduit	7	23	184,500	6,494	41.6	4,881		33,015	30.7	32,185	
—Mechanical tubing	11	24	1,038,450	63,643	72.5	59,454		476,844	78.9	476,802	
Wire rods	25	25	6,883,170	334,347	57.5	95,052	21,379	2,562,463	64.0	725,751	190,647
Wire—Drawn	40	26	5,555,130	279,918	59.6	162,691	5,938	2,074,937	64.2	1,184,324	31,284
—Nails and staples	18	27	1,240,900	48,566	46.3	50,437		395,031	54.7	388,436	
—Barbed and twisted	15	28	546,230	19,856	43.0	19,764		147,451	46.4	146,309	
—Woven wire fence	15	29	1,110,200	30,007	32.0	29,592		222,812	34.5	222,072	
—Bale ties	12	30	150,660	5,798	46.3	6,921		46,183	52.7	45,886	
Black Plate—Ordinary	9	31				43,378				276,746	886
—Chemically treated	8	32	464,000	9,580	24.4	8,045		89,811	33.3	85,038	
Tin and Terne Plate—Hot dipped	9	33	3,719,650	195,628	62.2	187,792		1,078,987	49.8	1,153,703	
—Electrolytic	10	34	2,155,100	59,665	32.7	58,163		388,180	30.9	368,680	
Sheets—Hot rolled	28	35	20,085,600	1,020,912	60.1	517,134	21,182	7,286,104	62.3	3,687,999	147,339
—Cold rolled	14	36	7,318,780	313,931	50.7	157,342		2,133,814	50.1	1,180,511	
—Galvanized	15	37	2,681,130	113,958	50.3	109,653		753,777	48.3	742,153	
Strip—Hot rolled	22	38	8,549,590	221,951	30.7	139,213	22,314	1,559,196	31.3	994,112	160,896
—Cold rolled	34	39	3,267,470	97,609	35.3	87,847		686,813	36.1	638,780	
Wheels (car, rolled steel)	5	40	343,800	23,999	81.4	22,799		170,033	83.8	166,661	
Axles	6	41	416,170	14,302	40.7	14,217		119,963	49.5	115,916	
All other	5	42	172,290	4,447	30.5	4,705		25,405	25.3	25,784	
TOTAL STEEL PRODUCTS	153	43				5,597,631	515,905			40,513,244	3,660,638
Effective steel finishing capacity	153	44	64,722,000								
Per cent of shipments to effective finishing capacity	153	45				92.9				97.8	

Canada Has Spent $1,200,000,000 In Expanding Manufacturing Facilities

Ottawa

• • • **Canadian Government** officials point out that this country, since the end of 1939, has expanded its manufacturing facilities by installation of new plants and equipment at a cost of about $1,200,000,000. In addition to this large industrial expansion, for which the Federal Government has contributed some $900,000,000, and private enterprise about $300,000,000, there is now in Canada a knowledge of new trades and methods of developing raw materials, which, government officials believe, will contribute considerable toward a national self-sufficiency along certain lines in peacetime.

Officials stress, however, that the Dominion has not attempted to make herself economically self-sufficient, that she was forced to expand industrially when she was unable to import war materials of which she was in need. They add that Canada is and will continue to remain dependent on other nations for many of her industrial requirements.

Heading the list of industries which have taken on impetus from wartime exigencies is the aluminum industry, in which Canada has increased many times her peacetime production. She ranks second after the United States in world production of this metal. Magnesium production also has taken great strides in the Dominion.

Canadian shipbuilding has developed beyond the most optimistic expectation during the war, and recently the major Canadian shipping companies placed before the Federal Government their proposal that Canada restrict its coastal trade to ships now registered in Canada and hereafter built in Canada, and that "if necessary" it subsidize Canadian shipowners engaged in foreign trade out of Canadian ports. They also urge that Canada should do its own naval shipbuilding, and also should adopt a policy of government aid to Canadian yards to enable them to turn out ships for foreign ownership.

Preliminary to postwar resumption of normal trade relations, the Canadian Government has undertaken to facilitate the interchange of samples of new types of machinery and equipment between companies in Canada, the United States and Britain, C. D. Howe, minister of munitions and supply announced. The minister explained that this undertaking implements a resolution passed by the Combined Production and Resources Board, on which Canada is represented. He pointed out that the actual transfers of samples of machinery and equipment would take place between manufacturers in the three countries, and emphasized that Canadian manufacturers must still comply with the regulations restricting the use of labor and of steel, non-ferrous metals and other scarce materials. "In other words, the samples must be produced without detriment to the war effort," he said.

See Gradual Tapering Off Of Steel Production in Canada

Toronto

• • • **Despite the fact** that the steel supply situation in Canada is tight and mills are fully booked to the end of the year, and deliveries are being made only to a select group of non-war consumers, production of steel in this country has been gradually tapering off. According to figures supplied by the Dominion Bureau of Statistics, steel production for the month of July was only 71.8 per cent of rated capacity, while pig iron output held at 71.89 per cent.

During July pig iron production amounted to 166,004 net tons, a slight gain over the 161,899 tons reported for June, and compares with 151,369 tons in July, 1943. Output for the month under review included 145,484 tons of basic iron; 9774 tons of foundry iron, and 10,746 tons of malleable iron. During the month, one furnace was blown out, leaving nine stacks in blast and five down.

For the seven months ending with July, pig iron production totalled 1,115,527 tons against 1,019,158 tons in the same period of 1943, and 1,146,153 tons in 1942, the latter year being an all-time high record for Canada.

Output of ferroalloys in July amounted to 14,508 net tons, compared with 17,906 tons in the previous month, and 21,408 tons in July, 1943. Production included ferrosilicon, silicomanganese, ferromanganese, ferrochrome, chrome-x and ferrophosphorous. For the seven months' period, production of ferroalloys totaled 105,750 tons against 133,201 tons in 1943 and 124,561 tons in 1942.

Production of steel ingots and castings during July totalled 234,418 net tons, compared with 240,750 tons in June, and 250,508 tons in July a year ago. Output in the month under review included, 224,774 tons of ingots and 9644 tons of castings. In the seven months cumulative production totalled 1,747,001 tons against 1,749,661 tons in 1943 and 1,146,153 tons in 1942.

o o o

TAGALONG: *A baby elephant trys to keep up with Mama as she maneuvers along with an elephant train in the China-Burma-India theatre of war. This ancient method of transporting supplies is in sharp contrast to the speedy, modern methods in use today.*

o o o

NWLB's Cole and Feinsinger Expected to File Reports This Week

Washington

• • • **Public members,** David L. Cole and N. P. Feinsinger of the NWLB steel panel in the USWA wage case, are said to have prepared their report and are expected to file it this week with the board. The board, in turn, will submit its recommendations to President Roosevelt. It is the belief that the President, rather than confining his action to the steel wage case, will make some announcement about the steel formula, but use it as a vehicle to set up a broadened formula for higher wages. Reports are that the President will say, in effect, that the little steel formula has served a useful purpose and it should be maintained but given a broader terminal.

This, it is claimed, will be based on the fact that since Jan. 1, 1941, the cost of living has increased over the 15 per cent which now is the maximum wage increase permissible over the Jan. 1, 1941 wages that would be authorized. In steel this would mean an increase of 8c. an hr. over the present straight average time rate of $1.04, bringing the new rate of $1.12.

The average hourly rate with overtime now is $1.14, so that if an 8 per cent increase were granted, organized labor would get much of its demand for a raise in base rates that would yield wages on a 40-hr. week equivalent to those obtained from the 48-hr. week. The 48-hr. week in steel now averages $54.72. The 40-hr. week at a $1.1212 hourly rate would yield $44.85. USW has asked for an hourly rate of $1.36 or $54.40 for a 40-hr. week.

The President is expected to act before election on Nov. 7, but not before he returns from Quebec on Sept. 23.

The industry and labor members of the steel panel on Tuesday were completing their separate reports and they are expected to be ready in time to permit the public members to file their report by the end of the present week. The industry members are Hugh Morrow and Theodore Branscombe. The labor members are Stephen Levitsky and John Despol. While there may be agreement in these two reports, they are of course expected to differ on the wage scale. The prediction that something over an 8 per cent increase will be authorized is based on the study by Dr. Wesley C. Mitchell of Columbia University showing that living costs had increased approximately 5c. above the Bureau of Labor statistics estimate of 23 per cent since Jan. 1, 1941.

Tying in with the case is the problem of reconversion. OPA is reported to have made a new study of steel prices, differing with earlier conclusions that steel prices should be based upon wartime costs.

Now it is said that OPA is not in favor of increasing steel prices because of the savings the industry will realize from paying workers for only 40 hr. a week and from resultant downgrading.

It is reported that workers will lose from 6c. to 8c. an hr. because of the return to the 40-hr. week, or they will lose the same amount an hour because of downgrading.

RFC Disposes of Machine Tools

Washington

• • • **RFC in July** disposed of $1,665,000 worth of machine tools, and of 5215 machine tools declared surplus up to Aug. 15, a total of 4595 was sold. Machine tool inventories on that date held by the owning and disposal agency were valued at $4,000,000.

These are some of the figures included in the announcement of W. L. Clayton, Surplus War Property Administrator, that between May 15 and Aug. 15 approximately $38,000,000 of surplus war property had been disposed of by five authorized disposal agencies. Remaining inventories on Aug. 15 were $313,000,000. Up to the end of July, 85 per cent of the total surplus property had been declared by the War Department, with the Navy accounting for only 9 per cent.

So far, Mr. Clayton said, both RFC and Treasury Procurement Division, have realized a high percentage of cost in the disposals of surplus war property. RFC has arranged for sales of machine tools on terms of 15 per cent in cash, the balance to be paid in small monthly installments, bearing 4 per cent interest.

The Army and Navy have declared $145,000,000 in aviation surpluses to RFC up to Aug. 15, including 8234 aircraft and gliders and 5315 trainer planes, of which 4037 of the latter have been sold at an average of 60 per cent of cost.

SET TO SLIDE: *A section of a new and longer type of destroyer is shown being laid at U. S. Steel's Federal shipyard in Port Newark, N. J. Modern prefabrication surrounds keel plates with part of the ship's bottom before it is laid on a shipway.*

OWI Says Cutbacks Through August 31 Amount to $421,493,000

Washington

• • • **Pointing out** that they are usually completed in the four months after announcement of the action taken, OWI in a recent statement said that cutbacks during the 11 weeks from June 15 through Aug. 31 had amounted to $421,493,000. In that period a total of 407 cutbacks proposed by government procurement agencies was reported to the WPB executive committee staff. The reduction in monthly production rates after the first four months will be substantially greater than the immediate effect as reported.

OWI pointed out that some of these were "paper cutbacks" cancelling production that was only in the planning stage. Other cutbacks were made in plants having sufficiently heavy backlogs of orders to continue in full production, substituting other items for the work cutback. Approximately one-fourth of the cutbacks were reported to have resulted in a decreased rate of production that would release workers in affected plants. The report indicated that an estimated 49,200 employees will be released when these cutbacks become fully effective. Many of these workers were absorbed at once on other work in plants in which they were employed or were offered other war jobs.

In number and in dollar volume, as well as in employees released, cutbacks were greatest in the aircraft industries. There were 74 cutbacks in that industry, involving contract cancellations or reductions amounting to $134,231,000 in the first four months and the prospective release of 21,869 workers. Ship cutbacks totaled $74,836,000 in the first four months with prospective release of 6580 workers. Cuts in guns and related equipment amounted to $47,912,000 in the first four months with the release of 9958 workers indicated. There were smaller cutbacks in other munition fields.

The Army placed 227 of the 407 cutbacks, amounting to $233,230,000 in the first four months and indicating a release of 31,033 workers, including the 21,869 employed in the aircraft industry. There were 161 Navy cutbacks amounting to $173,939,000 in the first four months with prospective release of 14,042 workers. Other cutbacks took place in commodities such as aluminum and magnesium.

New York had the most cutbacks, 56, but Texas has the largest number of workers scheduled for release, 15,034. The Texas releases are being concentrated in a major cutback that is taking place in the North American Aviation Plant in Dallas. Michigan had the largest dollar volume of cutbacks, a total of $66,376,000 in the first four months.

Trend Changes in Warehouse Sales

Cleveland

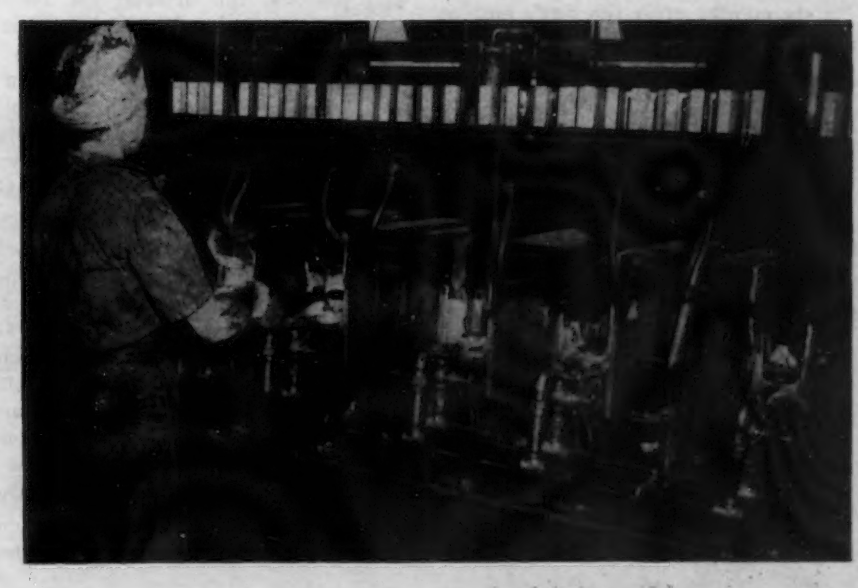
• • • **Prime steel warehouses** here report August sales running about parallel with July sales but note a distinctly changing trend in their nature. The sales of the past month are described as following the pattern of peacetime sales much more closely. Hesitancy in buying is also noted as shops in the area hold closer to inventory restrictions. Warehouse stocks are not increasing and mill deliveries to warehouses are becoming farther extended each week.

While sales volume remains about constant warehouses here report that they are being asked to operate more like regular steel warehouses. Steel is not being over-bought so generally by purchasers and orders are becoming much more specific. Where customers formerly bought the closest item they could find in stock to their actual need or accepted steel in stock lengths and often in even-weight quantities often in excess of actual need the trend now is to demand exact sizes and amounts and to buy no more than is needed.

This has had the effect of placing warehouse business more on familiar ground but at the same time has strained the manpower situation even more than before. The heavy increase in demand for cutting, burning and partial or complete fabrication has tended to slow deliveries slightly and has demanded more manhours than are available in some cases.

Some warehouses report a very slight easing in manpower supply, however, as workers begin to turn toward longer futured jobs in industries not directly dependent upon the war program. Some additional job applicants are showing up but not enough so far to strengthen the picture noticeably. Whitecollar workers are reported turning from high paid but short futured war jobs to the warehouses in slightly greater numbers.

SLUG HEATER: *A worker at a U. S. arsenal heats slugs for bomb noses with an American Car and Foundry Berwick Electric 6-electrode slug heater. Slugs are hexagonal steel. One minute and 20 seconds are required in the heating process.*



Industrial Briefs . . .

• INCREASED OPERATIONS—Rheem Mfg. Co. has concluded negotiations to operate a plant at Williamsport, Pa., to produce 8-in. projectiles for the Philadelphia Ordnance District, according to an announcement by the company's president. The Williamsport plant will be purchased by the government and leased to Rheem, which will re-equip it for the machining of projectiles.

• NEW SALES OFFICE—Bliss & Laughlin Inc. has opened a new sales office in Hartford, Conn., to provide better service in the distribution of its cold finished steel products. The office is located at 650 Main Street, and Walter A. Fairchild is in charge.

• OFFICERS ELECTED — The American Coordinating Committee on Corrosion recently elected Frank L. LaQue, of the Development and Research Division, International Nickel Co., as chairman for the current year. Dr. George H. Young, of the Mellon Institute of Industrial Research, was named vice-chairman, and George W. Seagren, also of the Mellon Institute, was elected secretary-treasurer.

• REPRESENTATIVE APPOINTED —Mixing Equipment Co., Rochester N. Y., announces that Edgar A. Rogers has been appointed exclusive representative in Georgia, Alabama and most of Tennessee.

• PRODUCTION HIGH — Package Machinery Co., Springfield, Mass., announces a new high production during July of invasion gyro-compasses for the Navy—a gain of 550 per cent over last November when manufacture was begun.

• SPECIAL DISTRIBUTOR — Ohio Crankshaft Co., Cleveland, has appointed the Anderson Machine Tool Co., St. Paul, as a special distributor of Tocco process induction equipment.

• SCREW SUPPLEMENT—A supplement to American Standard "Socket Set Screws and Socket Head Cap Screws" (ASA, B18.3-1936) has recently been announced by the American Standards Association, New York. The leaflet can be procured from the association for 10c.

• NEW QUARTERS — Frostrode Products, industrial refrigeration firm, has moved to a new plant at 19929 Exeter, Detroit 3.

• NAME CHANGED—P. A. B. Co., Worcester, Mass., is now known as the Anderson Tool & Stamping Co., Inc.

• EDWARD A. LONG, 63, one of the oldest distributors of machine tools in Boston, died Aug. 24 of pneumonia after an illness of several months. For the last ten years, he was in business under the name of Long Machinery Co.

Batcheller Predicts Large Postwar Steel Operating Capacity

Pittsburgh

• • • **In a voice ringing** with confidence and enthusiasm, H. G. Batcheller, president of the Allegheny Ludlum Steel Corp., here, predicted that within six months after the war's end his company would be back to within 85 or 90 per cent of the present operating level.

"I say that because I know from careful study the country is going to need steels, particularly the kind of specialty steels we produce, as it never needed them in any previous peacetime period," he said. The message was addressed to 4500 employees of the company now in the armed services whom he hopes soon to welcome back to "the most prosperous life in history."

The former director of the Steel Division and vice-chairman of the WPB did not minimize the problems of postwar readjustment of manpower but expressed confidence in the ability of management and the steelworkers union to reach a solution through the use of "good horse sense."

Mr. Batcheller assured the furloughed workers that despite talk of keen competition from lighter metals and plastics, the demand for steel, particularly alloy and specialty steels, will be "greater than ever."

He outlined some spectacular progress by research engineers of his concern, who, he said, "crammed into three years, work that would have covered a dozen or more in normal times."

These developments he said included heat-resisting metals which have helped the production of jet propulsion planes, of gas turbines, "the first really new kind of power plant which has been created in 50 years," a "casting of infinite precision" which promises opening a new field, and a harder high speed tool steel that has increased the life of some tools by 50 per cent.

Mr. Batcheller said he believed the time element favors an easier solution of the manpower readjustment because the European war likely will end before the one in Asia, and that thousands of emergency wartime workers are anxious to return to their normal peace time jobs.

Record for Finished Steel Set by U. S. Steel Subsidiaries

• • • **Shipments of 14,130,864** net tons of finished steel products by subsidiary companies of U. S. Steel Corporation during the first eight months of 1944 were the highest on record for the period. Shipments for August, 1944, were as follows:

August, 1944, 1,743,485 Net Tons.

The August shipments compare with 1,754,525 net tons in the preceding month (July), a decrease of 11,040 net tons, and with 1,704,289 net tons in the corresponding month in 1943 (August), an increase of 39,196 net tons.

The eight months' shipments of 14,130,864 net tons compare with 13,405,067 net tons in the same period of 1943, an increase of 725,797 net tons.

Now, Accurate Reflex Torquing— *faster than thought...*

Write for Bulletin SW-41

Buy More War Bonds

WITH THIS NEW WRENCH, accurate torquing becomes fast and automatic. When the exact "set" torque is reached, the SENSORY Mechanism sends three simultaneous nerve impulses to the operator's muscular control center, instantly releasing the tension by reflex action. Recorded through three channels—sight, sound and feeling—all three at once—or by any one of them individually, automatic reflex torquing is obtainable under every working condition, in spite of operator's physical handicaps—deaf, blind, or maimed, or degree of inattentiveness.

This new Sensory feature is built into standard STURTEVANT Permanently Accurate Torque Wrenches—the indestructable torque measuring wrench universally used for production, inspection and wherever torque must be accurately gauged. In the Sensory Wrench not a single basic Sturtevant design or construction features has been sacrificed, though reflex-speed has been added.

7 YEARS OF DEVELOPMENT

As the torquing of vital screws, nuts and threaded parts became a standard production operation, the need for *fast*, sturdy and accurate Torque Wrenches became apparent. As the manufacturers of 80% of the torque wrenches in use STURTEVANT has long been aware of this need. As creators of the Sturtevant Design Principle which eliminated all fragile mechanisms, springs, gears, glass dials and delicate parts and made possible sturdy, practicable tools that remained permanently accurate in the hands of ordinary workmen, ***we were determined that our production wrench would have to be not only fast-operating but also sturdily built and above all permanently accurate.*** As experienced tool makers we also knew that this wrench would have to give more than visual readings to meet every torquing situation.

For more than seven years STURTEVANT engineers have been working intensely on this problem . . . have been exploring, testing, designing, redesigning, perfecting and rejecting innumerable "speed" and "limiting" torque wrenches of all known and many new designs and principles. From this tireless research has evolved a new thing in high speed production torque wrenches, the *STURTEVANT SENSORY* Torque Wrench—a wrench that in use is faster than thought, still is a true STURTEVANT Torque Wrench that will stand all ordinary shop abuse and yet remain dead accurate.

THE STURTEVANT *SENSORY* TORQUE WRENCH

This new wrench closely resembles the familiar STURTEVANT Torque Wrench in appearance. It's the same size for capacity, weighs about the same also. It too can be dropped into the regular tool box with safety, will withstand the every day abuse given bench tools by careless workmen and still remain "dead accurate" even after long, hard service. It has the same legible STURTEVANT Dials which can be visually read from all working angles. Because experience has shown that visual readings not only provide a quick "check-look", but give the operators the assurance and *confidence* that they *must* have and insist upon, our engineers maintained this feature unchanged in the Sensory Wrench. But here is the difference—whereas the Sturtevant Torque Wrench depended *solely* on visual reading to determine accurate control of applied torque on caps, screws, bolts or threaded parts, the new STURTEVANT SENSORY Torque Wrench embodies two other features—two other safe-guards that help the operator maintain accurate torque at reflex speed—*"sound" and "feel."*

These Sensory features work as follows: A finger is provided which can be set at any desired signalling point. And from there on, until re-set, as torque is applied with the wrench, at the exact instant the "set" torque is reached, the sensory action (1) Sounds a loud and distinct click and (2) imparts a definite strong impulse to the hand. Thus, through *three* senses, sight, sound *and* feeling, the operator automatically releases (by reflex action) his pull on the wrench (even before the conscious mind reports it) making torque both fast and dead accurate. Here, through three channels instead of just one, the operator is conscious that the release point is reached, in spite of himself. Stop and think what accurate "reflex torquing" means:

1. It speeds up production while maintaining accuracy of torquing far beyond that possible with any other fast-operating production wrench.
2. Permits accurate torquing in dark or "blind spots," in deafening factory din, and from any working angle under *all* working conditions.
3. It enables physically handicapped workers, who may have one of these three senses impaired (blind, deaf or maimed) to do accurate torquing.

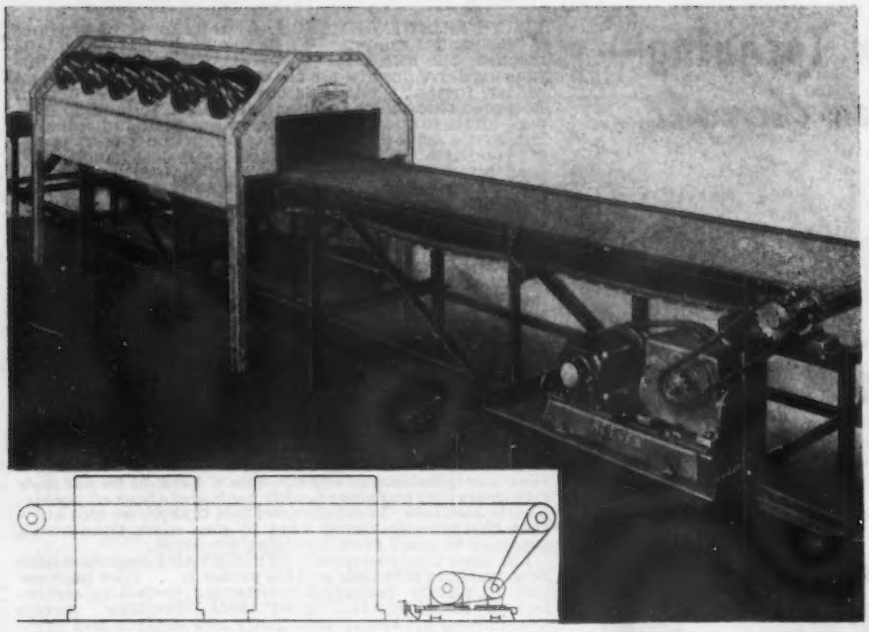
And for you engineers who like figures, read the results of the following field test made on an actual production line of a large engine builder using three 100 foot-pound Sturtevant Sensory Wrenches:

Type of Wrench	Description of Operation	Torque Limits in Ft. Pounds	Number of days in Service	Number of Nuts or Screws Tightened
S-100	Tightening Cylinder Head Cap Screws (21 per engine)	60-65	79	379,447
S-100	Tightening Connecting Rod Nuts (12 per engine)	40-45	79	227,520
S-100	Tightening Main Bearings (8 Main Bearing Cap Screws per Engine)	80-85	67	138,240

NOTE: Set only once, the day they were put on the job, these wrenches were checked periodically and found to be dead accurate throughout the test—no repairs, no re-settings, no adjustments.

Think what this means to industry . . . to your business in speeding up war production . . . what it can mean to you in post war competition. Any operator can now torque *accurately* without watching a dial—can torque automatically, even the wrench automatically "re-cocks" itself after each pull.

P.A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS



HARNESSING "INFRA-RED" TO PRODUCTION LINES

WITH REEVES VARIABLE SPEED CONTROL

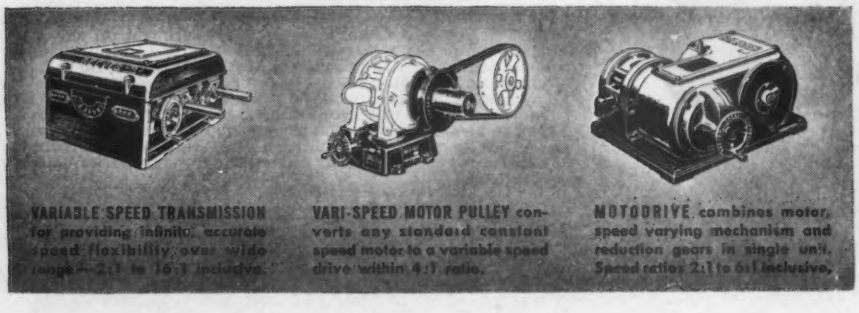
● Scientific genius and engineering ingenuity have again combined to conquer one of industry's most bothersome bottlenecks—the drying of surface coated metals. In this instance, success was achieved by adapting the "Near Infra-Red" drying process to continuous-flow production lines.

Shown above is a REEVES equipped Gifford-Wood N1-R Conveyor System, developed specifically for this purpose. Metal parts are carried continuously through a spray booth and baking tunnel, the tunnel being equipped with special incandescent (Infra-Red) filament lamps and reflectors. These heat the base metals to a predetermined temperature, creating what is known as radiant energy. As a result, surface finishes are dried and cured from the inside out.

Obviously, the time required for spraying and drying depends entirely on the size and weight of the parts being processed. And, because parts vary so widely in these respects, only infinite speed adjustability, as provided by REEVES Variable Speed Control, makes this system practicable for modern mass production methods.

REEVES Variable Speed Drives, for every conceivable type of production control, are easily installed on machines in service. Learn how the infinite speeds provided by REEVES Drives can importantly contribute to efficiency and economy in your plant. Write for catalog I-435 containing complete data.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA



VARIABLE SPEED TRANSMISSION for providing infinite accurate speed flexibility over wide range—2:1 to 16:1 inclusive.

VARI-SPEED MOTOR PULLEY converts any standard constant speed motor to a variable speed drive within 4:1 ratio.

MOTODRIVE combines motor, speed varying mechanism and reduction gears in single unit. Speed ratios 2:1 to 6:1 inclusive.

Australian Official Praises Americans In Press Conference

Pittsburgh

● ● ● **In the cloistered halls** of the swank Duquesne Club here recently, J. Lester Perry, president of the Carnegie-Illinois Steel Corp. a U. S. Steel subsidiary, introduced a dignified and learned Australian to members of the press. The guest, L. R. MacGregor, director of general war procurement supplies for Australia, proceeded to extol the virtues of the men, manners

HONOR GUEST: *J. Lester Perry (left) president of Carnegie-Illinois Steel Corp., a U. S. Steel subsidiary listens to L. R. MacGregor, Australian Procurement Director before press conference in Pittsburgh recently.*

and materials of his country and to dispel any doubt that might exist as to whether Australia is doing its part in the general Allied war effort.

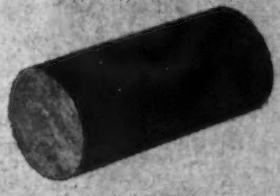
Mr. MacGregor told how Australia has given a tenth of its entire population directly to the war effort; how a tenth of its armed forces are now casualties; how the people of Australia have given all worldly things save for the bare necessities to the war effort; and how his countrymen admire and cooperate with the United States forces on the island.

As the Australian proceeded with his tributes to American industry, American labor, American enterprise and American unselfishness, a hush fell over the room and the air was

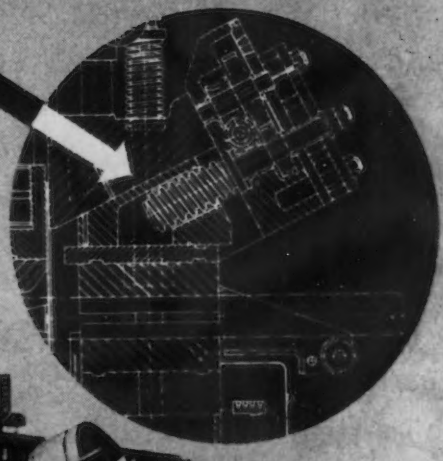
LOMA HYDRAULIC SHEAR AND NICK & BREAK MACHINE

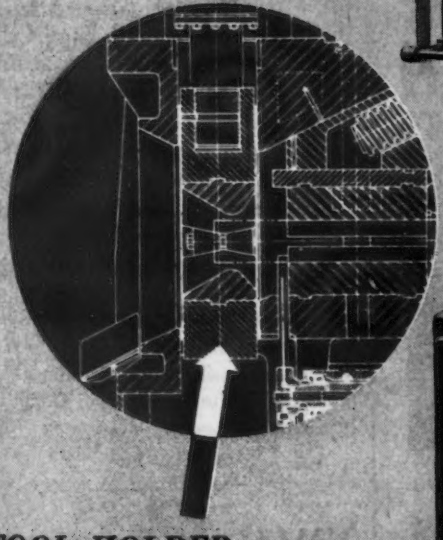
AIR OPERATED CLAMP
Wedge Action assures firm hold of stock

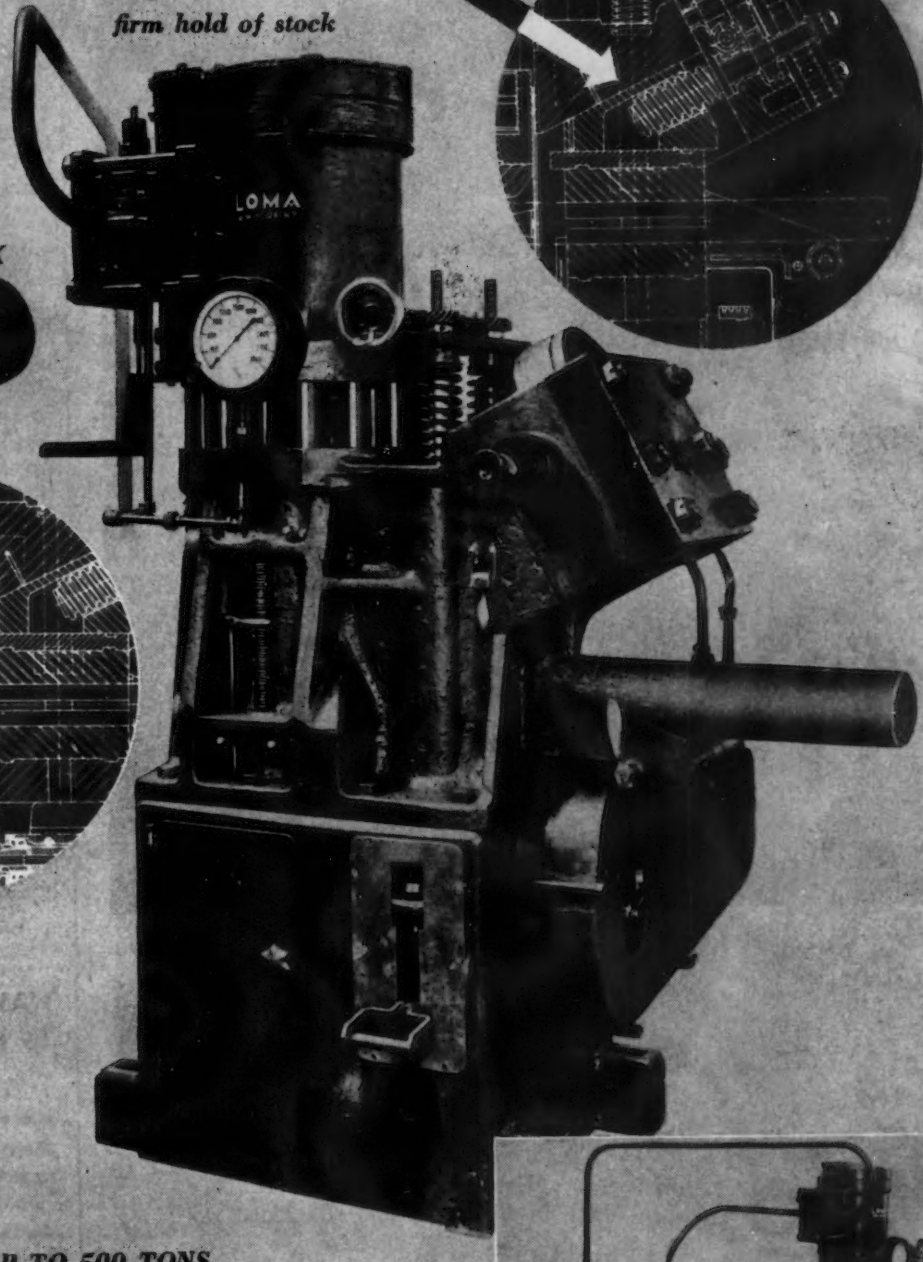
FOR A SMOOTH CUT



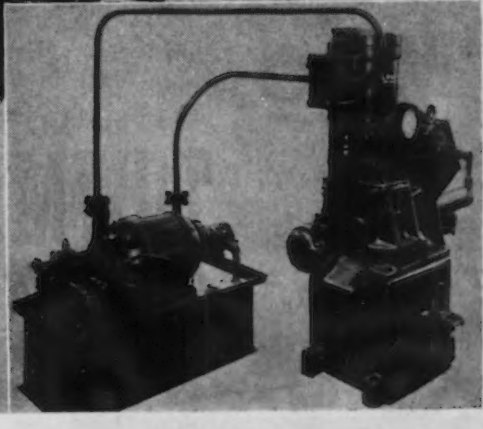
FOR A TEST BREAK







TOOL HOLDER
(shown for Test Breaks)
guided on all sides by adjustable wear plates



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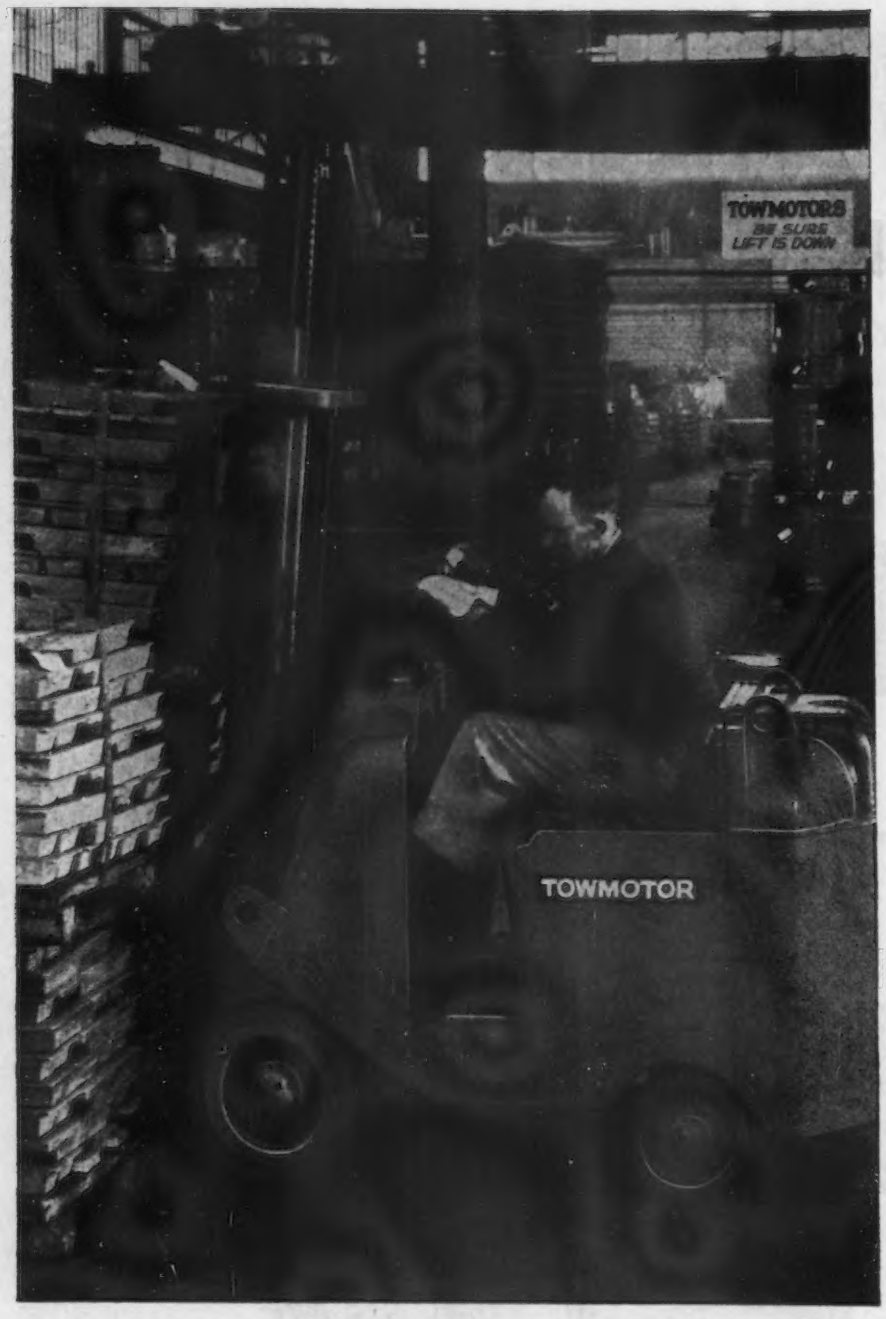

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filled with a feeling of impressive restraint. Public relations men, news and magazine reporters filling the rooms reacted with unnatural solemnity to the Australian's obvious sincerity.

Mr. MacGregor told the story of the "how" of reverse lend-lease. Containers, he explained, were produced in the States and shipped to Australia. On arrival, they were filled with Australian foodstuffs and sent either to Allied armies abroad or used by American forces stationed on the Island. "There is no mathematical formula," he said, "whereby anyone could possibly tell who owes who what after the war."

When the Australian concluded with the statement that he was realizing a lifetime ambition in visiting the home of Andrew Carnegie, a reporter broke the tension of the conference with a humorous question on the love life of Yanks and Australian girls during the war. "Well," he laughingly explained, "it's true the Americans have married a number of our girls, but our boys aren't doing so badly along that line themselves in England and the other theaters of war."

Pittsburgh was only one stop in a tour of the principal industrial cities in the U. S. visited by Mr. MacGregor this year. After visits to other American cities, he plans a longer visit to Canada, where he was stationed for eight years as a representative of the Australian government. Shortly after his press conference, Mr. MacGregor attended an informal dinner given by officials of the U. S. Steel Corp. in the Pittsburgh area.

NAM to Send Representative To Human Relations Institute

New York

• • • The role of monopolies and their influence on technological progress will be the subject under discussion by political scientists, economists, educators and other experts during the fall semester of the John L. Elliott Institute of Human Relations, New York. This series starts Oct. 11 and runs through Dec. 6.

Participating in these discussions will be representatives of the National Association of Manufacturers. The course will be conducted by Dr. Walton H. Hamilton of the Yale Law School and the Anti-Trust Division of the Department of Justice.

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Molybdenum

HIGH SPEED STEELS

for CUTTING TOOLS

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Our service department will gladly help you on problems of heat treatment, selection or application Write

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***EACH** of these steels assures you of Latrobe's distinctive qualities — superior heat-treating properties and longer tool life. Each is ideally adapted to its particular use.*

DOUBLE-SIX

C	Cr	W	Mo	V
.84	4.15	6.23	5.10	1.85

KA-TMO

C	Cr	W	Mo	V
.79	3.96	1.55	8.30	1.15

T.N.W.

C	Cr	W	Mo	V
88	3.90	—	8.00	1.90

HV-6

C	Cr	W	Mo	V
1.15	4.10	6.15	6.15	3.10

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5

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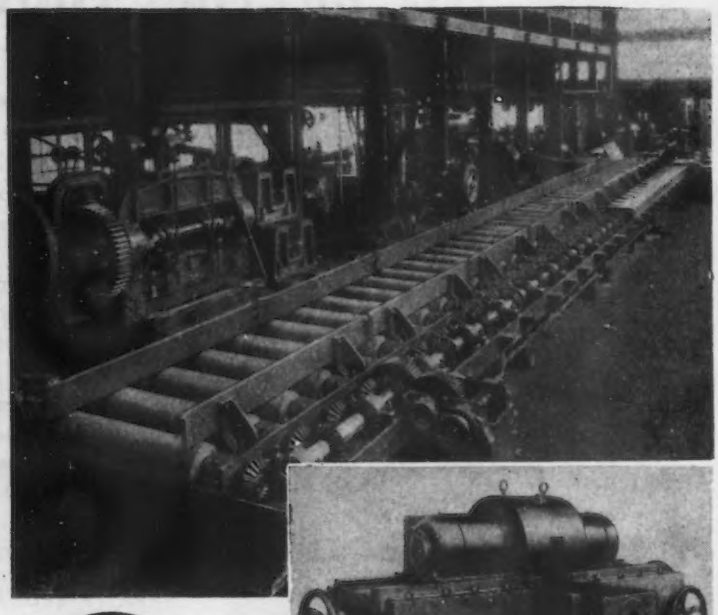

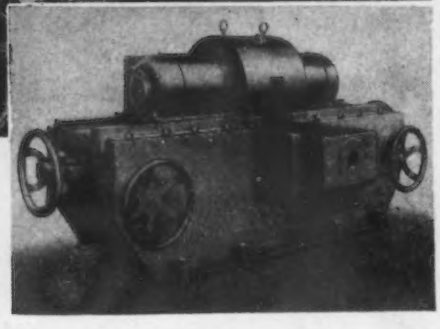

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PITTSBURGH, PA.

Engineer Gives An Interesting Paper On Chrome Plating

Los Angeles

• • • An interesting paper was read recently at the 1944 Aviation meeting of the A.S.M.E. here when C. L. Tanner, general manager, Spar-Tan Engineering Co., of this city, expounded the subject of "Flash Chrome Plating to Size."

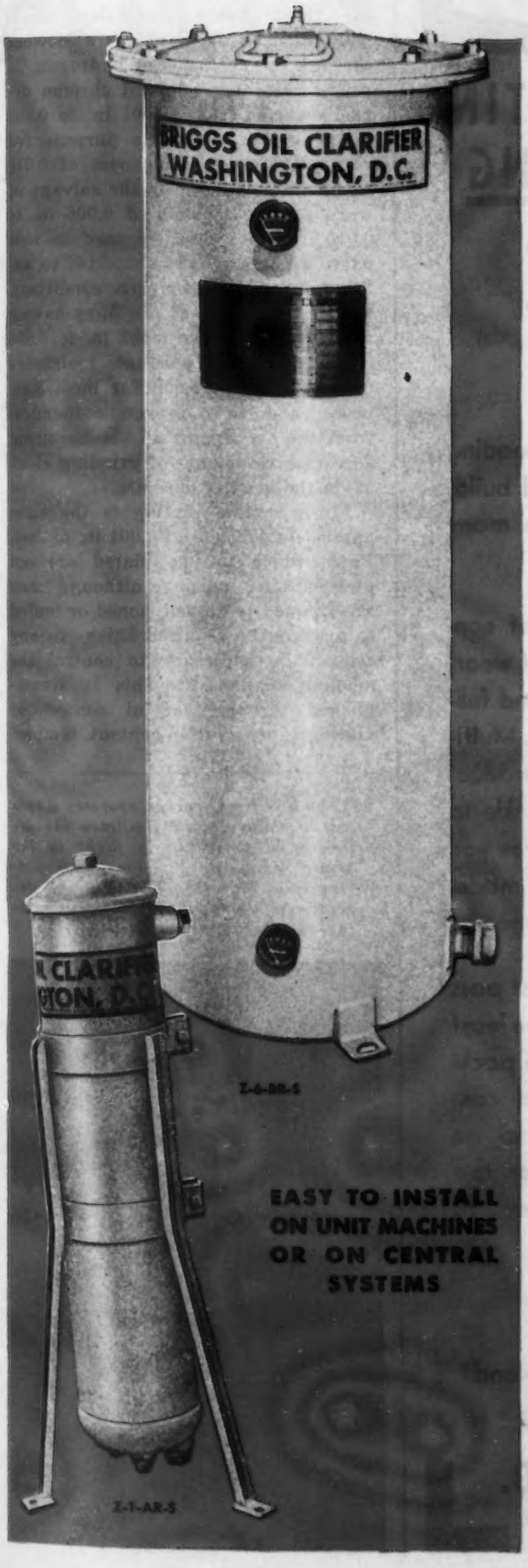
There are two general types of chrome plating, according to Mr. Tanner. One type is commonly referred to as ornamental or decorative chrome and is that which is applied to automobile bumpers, hardware, household appliances and articles of that nature. The process usually involves copper plating on the base metal, nickel plating over the copper, polishing the nickel to a mirror finish and then plating a very thin film of chromium over the polished surface.

The other type of chrome plating is known as hard chrome and involves electro-plating a more substantial quantity of chromium directly on the base metal. Since flash chromium plating is a form of the latter type, the most interesting characteristics of hard chrome were considered briefly. The outstanding property of hard chrome plating is its hardness. This varies somewhat in proportion to the amount of hydrogen involved during the plating operation, but a typical deposit has a hardness of 8 to 9 on Mohs scale, which compares favorably with that of hard facing materials.

Another factor which contributes to its usefulness is its resistance to corrosion. Hard chrome is not affected by most organic chemicals, alkalies or sulphur compounds. However, it is readily attacked by hydrochloric acid and more slowly by sulphuric acid. The co-efficient friction of hard chrome has been estimated as 30 per cent and 50 per cent less than that of steel and this property has been utilized in solving many engineering problems in which hardness and corrosion resistance are relatively unimportant compared to the necessity of reducing friction to a minimum. Chromium melts at 2822 deg. F. and retains a bright surface up to approximately 900 deg F. It is non-magnetic and has about the same heat and electrical conductivity as aluminum or one-half that of copper or silver.

Perhaps the most serious disadvantage of hard chrome is its extreme brittleness. It is not advisable to use it, Mr. Tanner explained, particularly

A New BRIGGS *Oil Filter*



for continuous filtration of soluble oils, low viscosity cutting oils, kerosene and cleaning fluids

used in

precision grinding, honing, light broaching, milling and lathe work where finish is important.

This newly-developed Briggs Filter will help you increase production, increase wheel or tool life and improve operating conditions. Because it will maintain the properly selected coolant in optimum condition at the wheel . . . free of metallic and grit particles . . . grinding and honing to desired tolerance and finish is readily accomplished.

In one plant, this filter reduced rejects from 60% to 12% . . . a daily saving of more than the cost of the filter. In another, normal coolant life of two to three days was increased to seven to ten days.

Get all the facts about the Briggs ZR Filter. Learn how clean coolants will contribute to higher production and lower operating costs.

Consult the Briggs distributor in your territory or write manufacturer for informative folder.

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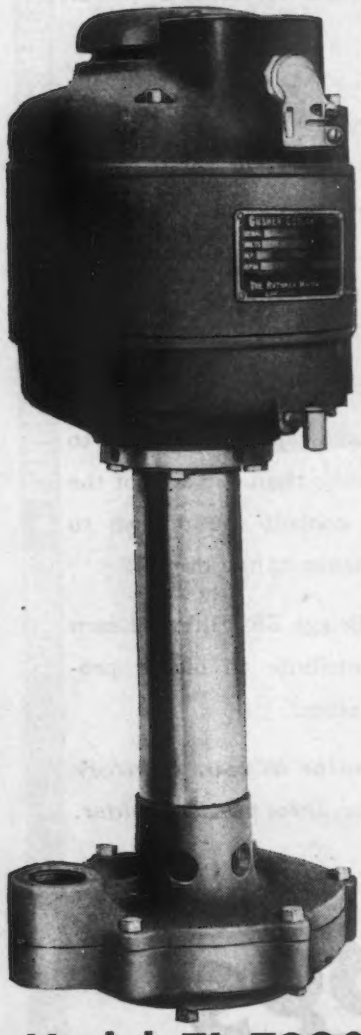
GUSHER
COOLANT PUMPS



Universally accepted by leading machine-tool designers and builders, GUSHER Pumps have many original features.

Simplicity and sturdiness of construction, with a minimum of wearing parts, assure long life and full-time, hard-usage service. Multiplicity of types and sizes, producing anything from a tiny trickle to 200 gallons per minute, gives you your choice of a Gusher model and type for your special needs.

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Model TL-7320

See Section 2 of new catalog, indexed for quick reference.

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THE "GUSHER"—A MODERN PUMP FOR MODERN MACHINE TOOLS

in heavy deposits, where there is danger of impact or where it is subjected to heavy compression loading on small areas. The brittleness can be reduced to some extent by heating to a temperature of 300 deg. F. to 400 deg. F. for three hours, but this treatment reduces the hardness somewhat through the evolution of hydrogen.

The thickness of hard chrome deposits varies from 0.0001 in. to 0.050 in. depending upon the purpose for which it is used. Thickness of 0.010 in. or more are used in the salvage of worn parts. Deposits of 0.006 in. to 0.010 in. are frequently used on new parts which are to be subjected to unusual abrasive or corrosive conditions. Most commonly used are films having a thickness of from 0.002 in. to 0.006 in. These provide adequate resistance to wear and corrosion for most purposes, and have proven economical from the standpoint of not requiring an excessive amount of grinding stock as do the heavier deposits.

Flash chrome plating is the term applied to deposits of 0.001 in. or less. Parts which are so plated are not ground after plating, although they are frequently lapped, honed or buffed to provide the required finish. In any case, it is necessary to control the amount of deposit. This is accomplished through careful control of plating time, solution content, temper-

SPIN TEST: *A worker operates a spin test machine which similates the action of a projectile in flight in the primer and fuse division of Willys-Overland Motors. The machine determines whether the fuse is "arming" at the proper moment.*

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You specify the steel—the electric furnace delivers.

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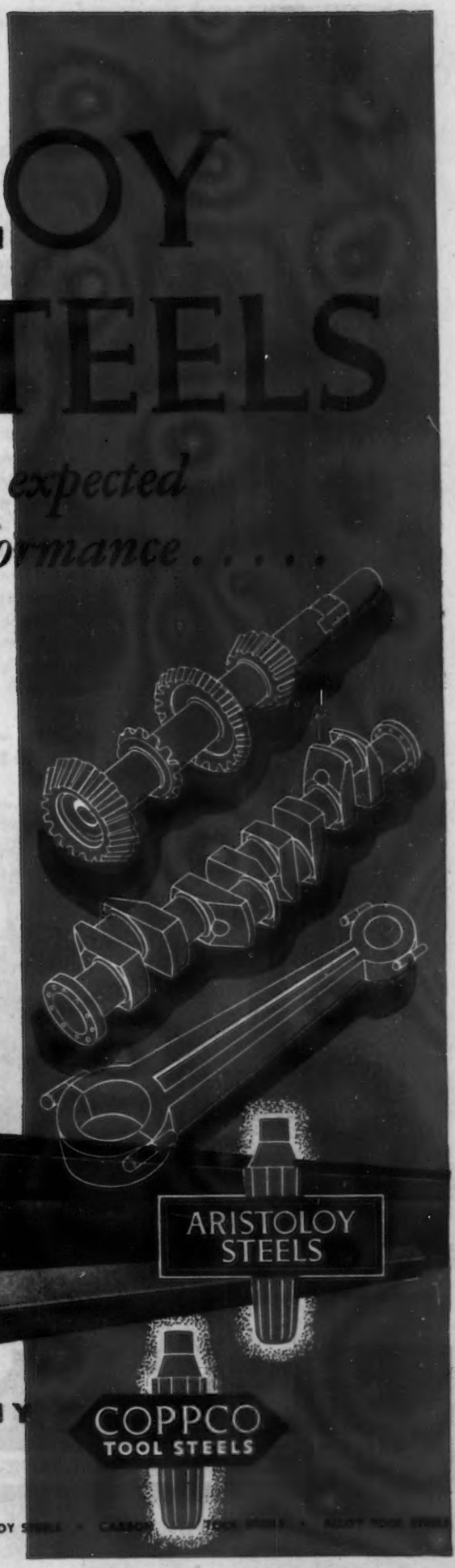

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ature and current density. Tolerances equal to one tenth of the plating thickness can be maintained.

Since any imperfection in the surface of the base metal is magnified in plating, it is necessary to exercise great care in the preparation of the surface before flash plating. After being ground, wheel marks should be completely removed before plating. This is most often accomplished by buffing, but in cases where true cylindrical form must be maintained, lapping or honing is sometimes used.

One of the most publicized uses of flash chrome is its application to cutting tools. Originally hard chrome was used to salvage worn tools such as taps, drills, reamers, and forming tools. This did not prove profitable due to grinding costs. However, it did indicate that advantages could be gained through flash plating. It is now common practice to flash plate new tools or those which are slightly worn.

The principal advantage gained through reduction of friction, according to Mr. Tanner, is that plated tools do not pick up metal being worked and chips tend to slide off the tool surface without transferring their heat to the tool. In one instance, the life of chasing cutters was increased ten times cutting ¾-20 threads in 4130 steel—similar results have been obtained with other cutting tools.

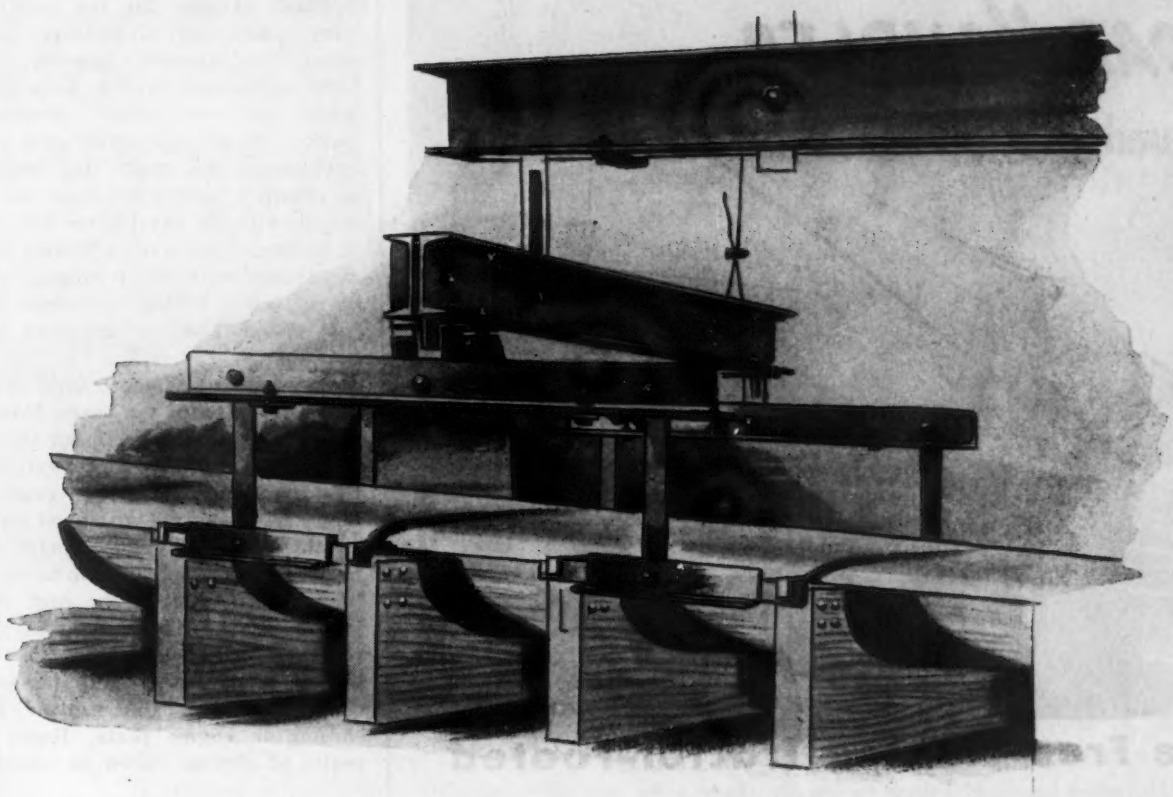
Flash chrome has been used successfully in increasing the size of standard drills, taps and reamers to produce holes or threads which are slightly larger than standard sizes. It is possible to increase diameters by as much as 0.002 and still maintain close tolerances. This has often saved the cost of special tools.

One of the important uses of flash chrome is in metal stamping. Through the reduction of friction better parts are produced with less rejects. The life of dies is greatly increased since the chrome can be replaced before any steel has been removed from the die.

Plastic and rubber molds frequently present problems due to the corrosive action of the material being molded or through adhesion. In most cases flash chrome solves the difficulty and is widely used.

In the oil tool industry flash chrome is finding favor for many purposes. One manufacturer uses flash chrome on the threaded stem of gate valves to reduce friction and prevent corrosion. The cap screws used on the bonnets of large valves are flash chrome plated to facilitate their removal when repairs are necessary. Reciprocating

THE POWERFUL "SAP" OF THE WHIFFLETREE



An arresting aircraft application of Hele-Shaw Fluid Power—

AIRPLANE WINGS have to be load-tested. For years this has been done by "shot-bag" loading. But shot-bag loading is slow, laborious and costly, and does not duplicate flying conditions.

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Hele-Shaw hydraulic engineers are helping to unravel many knotty problems in machine design and operation concerning such mechanical movements as pulling, pushing, stretching, squeezing, lifting, tilting . . . many others. Possibly they can help you. Active investigation of Hele-Shaw Fluid Power now might hasten your take-off in the competitive race after the war.

THE
Hele-Shaw
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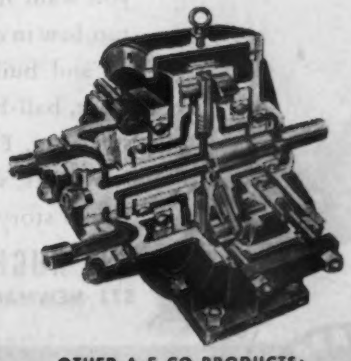

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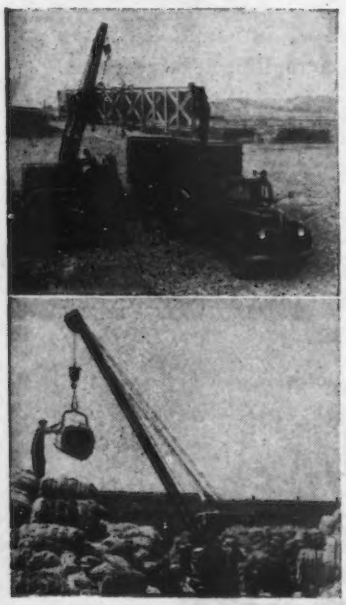

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pump rods are plated to provide a better packing surface.

Flash chrome has not been used very extensively in hydraulic equipment for aircraft; however, there isn't any reason why it shouldn't in many instances replace heavier deposits which require grinding. One problem in this connection would be to obtain a perfect finish on the base metal without developing flat spots in buffing. This could probably be accomplished with either super-finishing or centerless buffing—centerless buffing would also be indicated after plating.

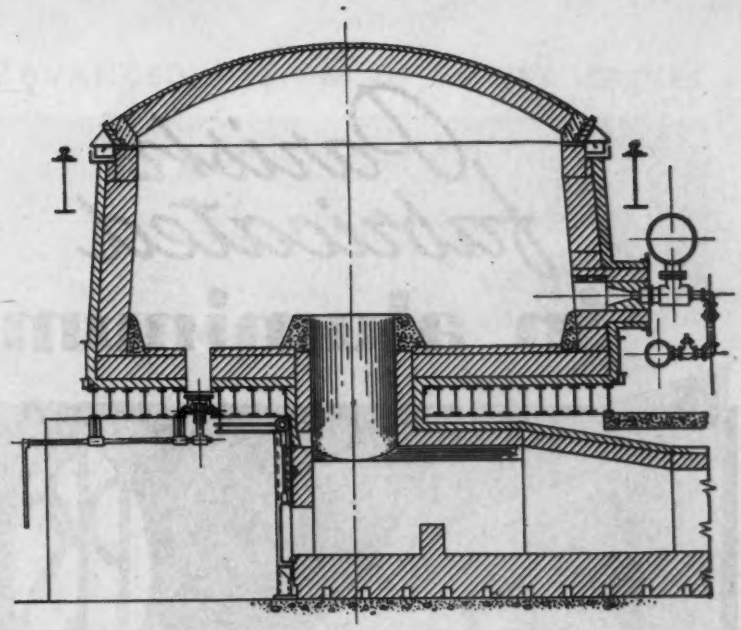
Hard chrome has been used on plug gages for perhaps ten years. More recently flash chrome has been found to be just as effective. Where very close tolerances are encountered, gages are lapped after plating with good results. The life of thread gages is indefinitely prolonged by grinding them to the low limit and plating to the high limit. When worn to the low limit they are replated.

There have been many important developments in the use of flash chrome on engine parts. Heavy deposits of chrome failed on camshaft

---

NEW METHOD: *A skilled mechanic arc welds a landing gear for one of the Navy's Grumman fighter planes at Willys-Overland Motors. Here, production has been increased 30 per cent by substituting arc welding for gas welding.*

7 OPERATING ADVANTAGES • SALEM CIRCULAR SOAKING PIT



Sectional view of a Salem 20' diameter Circular Ingot Heating Furnace.

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4. Any fuel can be adapted on either a continuous or intermittent basis.
5. Accurate control and uniformity of heat distribution permit most exacting heat treating practices.
6. Minimum scale loss assured by accurate temperature control and automatic atmosphere control.
7. Furnace can be cooled quickly or brought up to proper temperature fast because of the relatively small amount of brick in the design.

One superintendent who has used a 20' Salem Circular Soaking Pit for more than six years says—"I like the Salem Pit because our records prove we save substantially on each ton of steel prepared in the Salem Pit."

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lobes. Thicknesses of 0.0001 in. to 0.0003 in. have been very successful. Crank shafts have been flash plated with good results as a means of reducing friction. There are two Continental truck engines in operation with cylinder walls plated to size. They have not been in service long enough to draw any definite conclusions, but the engines are operating efficiently. Valve stems are flash chrome plated to reduce wear and eliminate sticking and the surfaces under the heads have been successfully plated to prevent adherence of gummy deposits. An oil producing company has had difficulty with carbon deposits in engine cylinderheads where casing head gasoline is used. This condition has been corrected by flash plating the heads.

Westinghouse Gives Extensive Electronic Training Program

Pittsburgh

• • • Designed to give in a clear, understandable manner the basic principles and applications of Electronics in industry, a new ten-part training course covered by sound slide films, lesson books, quiz books, and an instructor's manual has been prepared by Westinghouse.

Although designed primarily for Westinghouse employees, the material has been made available to others at reproduction costs because of many requests from engineering groups and individuals interested in Electronics.

It is recommended that 20 hrs. should be allowed for the full 10-part course—two hours for each part, with classes held one night each week.

Sound slide films and records for the ten lessons give clear, visual explanations of basic theory and applications. (For use with standard sound slide film equipment). Ten lesson books in handy pocket size, reproducing the subject matter of each lesson, are provided for each member of the class. These afford a convenient means of review and supplemental study. Pictorial quiz books are supplied for mid-course and final review of the subjects covered, and an instructor's manual giving suggested classroom procedure is provided with the complete course. Informative booklets on industrial electronic equipment are supplied covering ignitron rectifiers, high-frequency heating, resistance welding, power line carrier, rototrol, sealed ignitron, and electronic tube data sheets.

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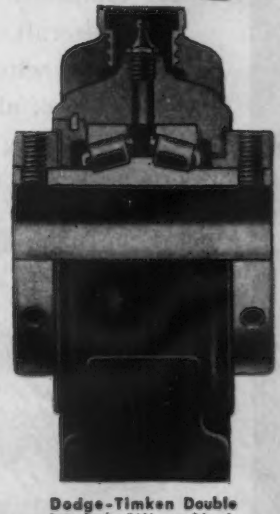
Advanced Transmissioneering may very likely provide a better solution to some of your operating problems, as was the case of the steel mill run-out tables. The application of Dodge Transmissioneered equipment can easily be the means of obtaining more efficient, more profitable, and more trouble-free production. Call your local Dodge Transmissioneer, the Dodge Distributor. He can give you valuable advice about the use of Dodge Transmissioneered equipment on your production machinery.

DODGE MANUFACTURING CORPORATION, *Mishawaka, Indiana, U. S. A.*



Dodge-Timken Double Interlock Pillow Block

BACK THE ATTACK WITH MORE WAR BONDS

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BRIDGEPORT • CONNECTICUT

Weekly Wages Reach $49.23 for June To Make All-Time Pe

New York

• • • Average weekly earnings of wage earners in the 25 manufacturi industries regularly surveyed by t National Industrial Conference Boa rose 1.6 per cent from May to June reach a new all-time peak of $49.23.

This increase, which was account for by rises in both average hou earnings and hours worked per we marked an advance of $18.62, or 6 per cent, over average weekly earnin in manufacturing in January, 19 the base month of the "Little Ste formula.

Since the cost of living declin slightly in June, "real" weekly ea ings, which measure the quantities goods and services that can be pu chased with dollar weekly incom rose more than actual weekly ea ings, or 1.7 per cent.

Key figures of the Conferen Board's survey for June are as fo lows:

Hourly earnings rose 0.6 per ce to $1.068 in June, highest on reco for the 25 industries averages. Th figure marks an increase of 40.7 p cent since January, 1941, and a ga of 48.3 per cent since August, 1939.

Weekly earnings, at $49.23, we 1.6 per cent above the May averag 60.8 per cent above that for Januar 1941, and 80.4 per cent higher th that of August, 1939.

"Real" weekly earnings, rising per cent from May to June, were 3 per cent higher than in January, 19 and 45.0 per cent above August, 19

Hours worked per week on average were 45.9 in June, an in crease of 0.4 hr., or 0.9 per cent si May. This marks a gain of 5.7 since January. 1941, and one of hr. since August, 1939. However, t prevailing work week was long prior to March, 1930.

Employment in the 25 industries d clined 1.0 per cent in June—t seventh consecutive monthly decrea Employment was still 27.8 per ce higher than in January, 1941, and 6 per cent above that of August, 19

Man hours declined very slightly June, only 0.1 per cent, but remain 46.0 per cent above January, 19 and 100.8 per cent above Augu 1939.

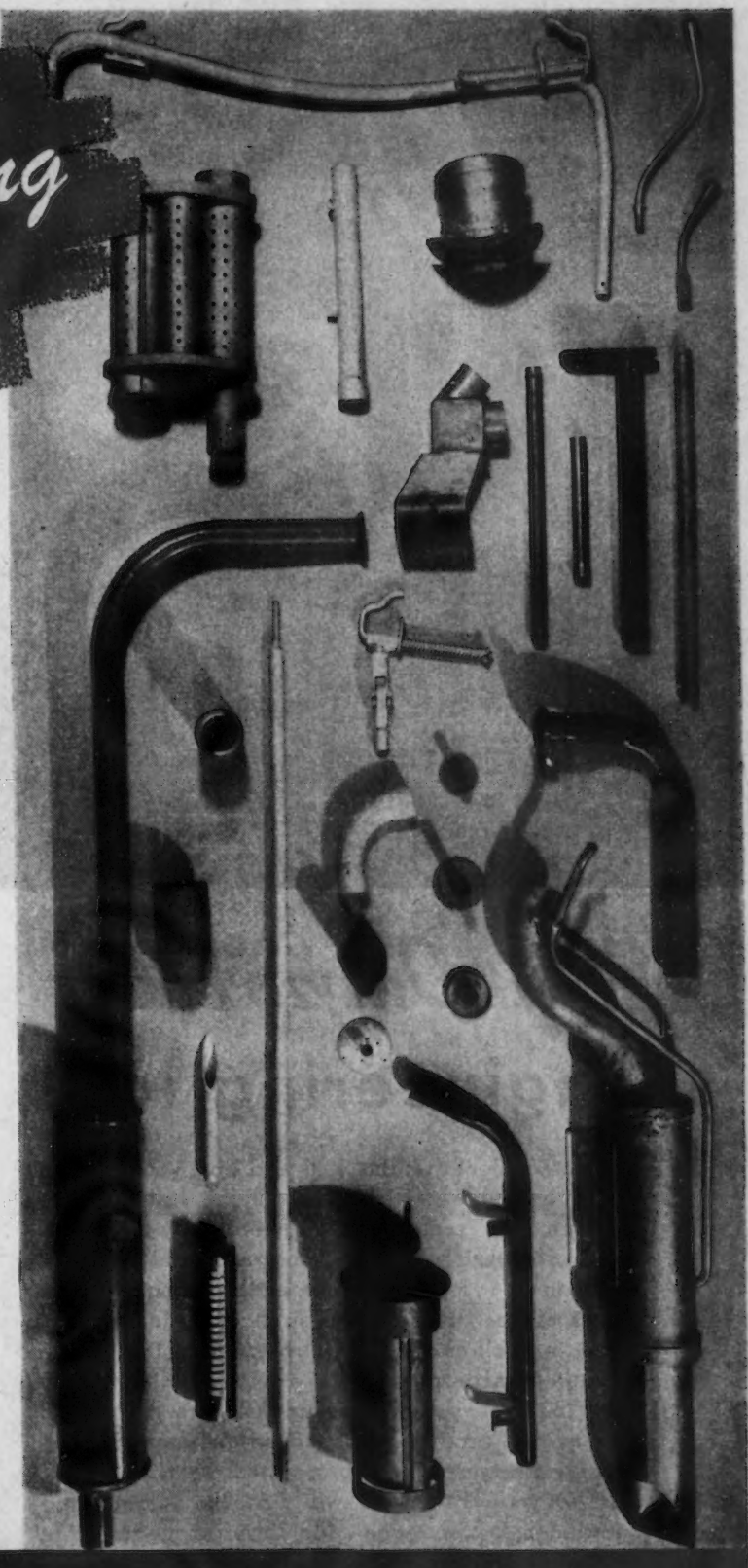
Payrolls rose 0.6 per cent from M to June despite the decline in emplo ment. Since January, 1941, payro have risen 105.5 per cent, and sin August, 1939, 198.5 per cent.

A FEW TYPICAL

Metal Tubing

AND STAMPING

Assemblies



Fabricated by Us for Other Manufacturers

● This picture shows only a few of many different kinds of metal tubing and stamping assemblies—fabricated by Noblitt-Sparks—to go into the products of other manufacturers. But this may suggest something that our company might make for your company—now or later—to your advantage as well as ours.

Noblitt-Sparks makes and forms metal tubing into any shape—welds it to other parts stamped from metal — assembles, plates or paints the entire unit—ready to go into your product.

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Harlow Faulke

Vice-President and Director of Manufacturer's Parts Division
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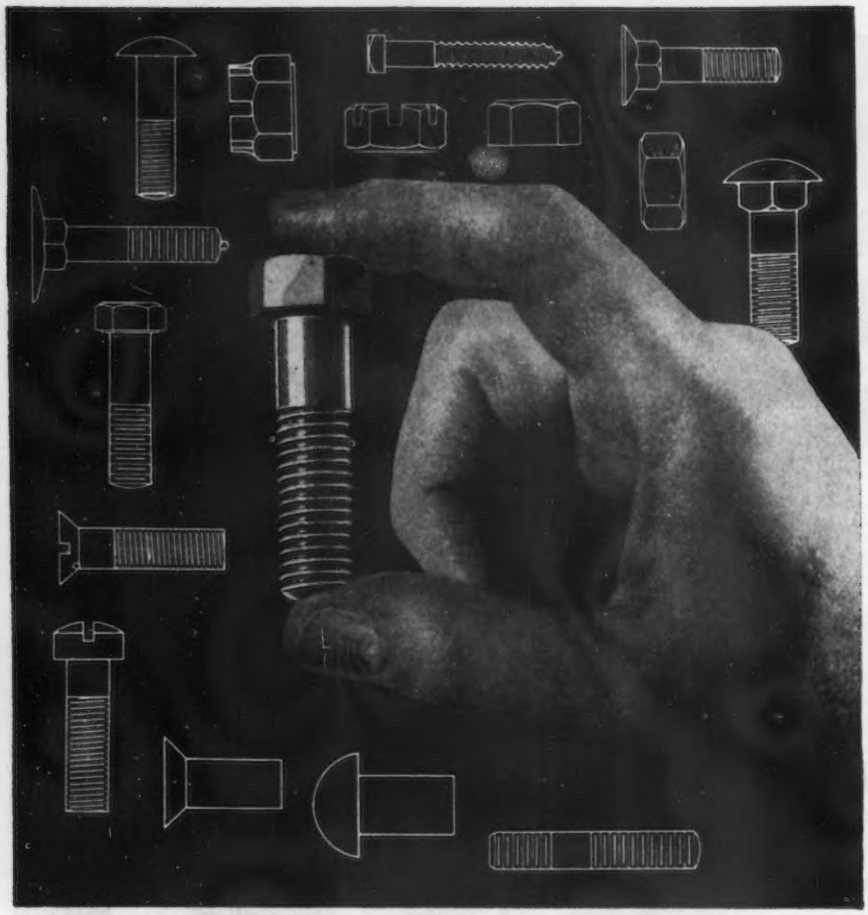

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It is no accident that the bolts and nuts you get from Oliver assemble perfectly, hold tight, last long. To produce such results, our engineers study the metallurgy of materials, effects of hot and cold working, flow of metal in forming processes, threading methods, effects of heat treating and surface hardening processes, as well as quality-control methods that assure accurately made products.

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OLIVER IRON AND STEEL Corporation

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Predicts Period Of Greatest Building During Postwar Era

Pittsburgh

• • • In the first three to five postwar years the United States will experience the greatest volume of industrial building and greatest employment of construction workers of any similar peacetime period, S. M. Rust, Jr., vice president of the Rust Engineering Co., Pittsburgh, and Birmingham, Ala., predicted.

This building will start in large volume immediately after war restrictions are relaxed, as industries rush preparations to skim the cream from huge pentup postwar markets. Thousands of inquiries and orders for designs of new plants and alterations of existing plants have been, and are being, received by engineering firms throughout the country, Mr. Rust said, providing a solid, factual basis for his assertions.

The type of designs most usually sought, he further commented, are "master plans," not for single structures but covering all the building and development contemplated by the firms concerned for five or more years.

Mr. Rust stated:

"Contrary to popular belief, our tremendous construction of war plants will not halt or make unnecessary extensive postwar industrial building. The effect will be just the opposite. The huge competitive potentialities of these plants will force industrial management to modernize to the limit and to build many entirely new plants in order to stay in the running.

"The combination of this biggest production capacity ever known, the biggest consumer market (as verified by research polls), and most extensive launching of new materials and products, represents the key to postwar industrial construction.

"To meet this unprecedented competition, far-reaching re-organization of plants and operations is being prepared by a great number of industrial firms. Two major factors in most future planning are:

(1) "One hundred per cent continuous, assembly line type production, machine operated to the fullest extent. In pre-war years less than 50 per cent of industry produced on such a basis.

(2) "Standardization of products to a hitherto unimagined extent, both for industrial use and the public. One

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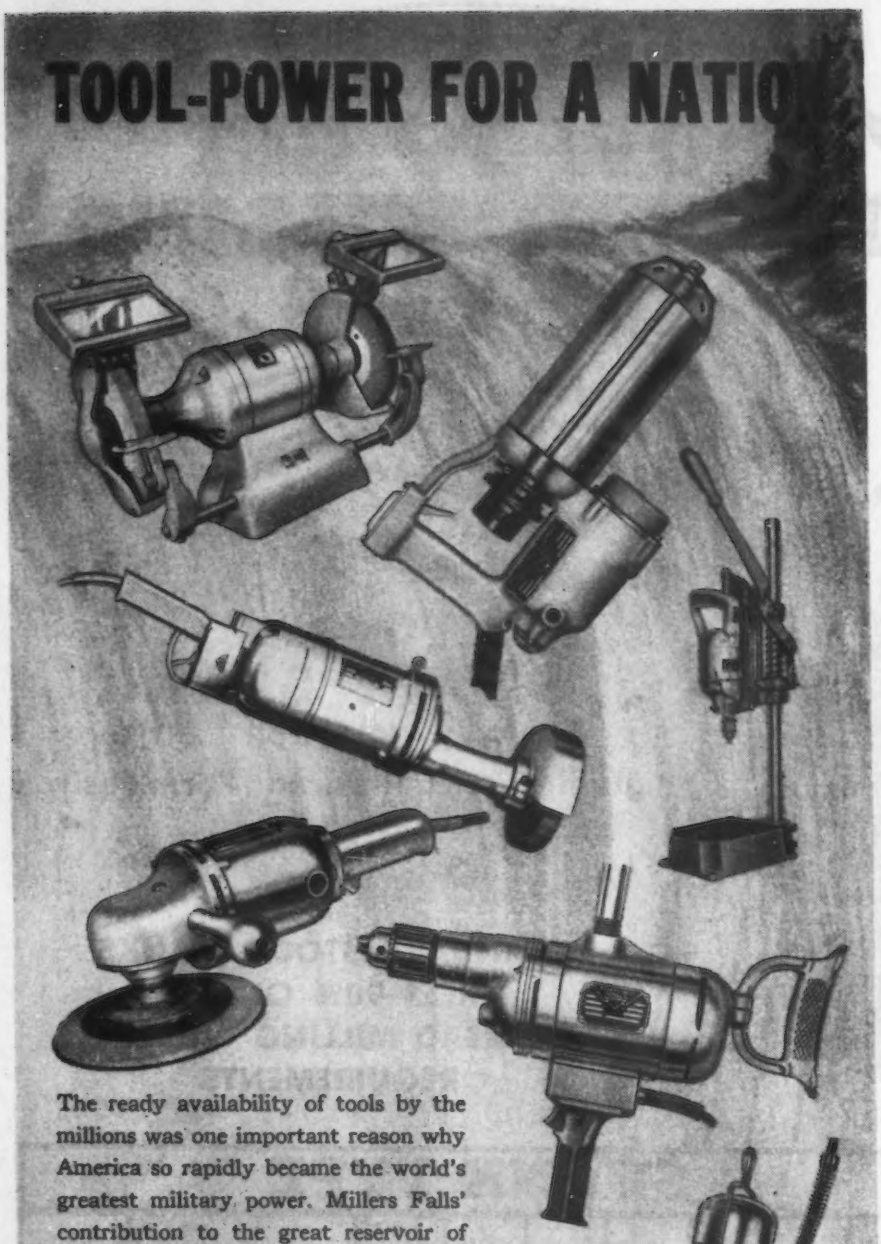

The ready availability of tools by the millions was one important reason why America so rapidly became the world's greatest military power. Millers Falls' contribution to the great reservoir of tool-power has been tremendous. Time and again, production records have been broken to meet the unceasing demands for hand tools, electric tools, precision tools . . . tools of all kinds.

Tool-power for a world at peace will be as vital as for war. For construction and reconstruction, for pioneering on new frontiers, for building the better world that Victory will make possible, the great demand for tools will continue far into the future.

Millers Falls will be ready to meet this new demand for the tools of peace. Meanwhile, Millers Falls tools for industry-at-war are available. Ask your Mill Supply salesman for complete details.

MILLERS FALLS TOOLS

SINCE 1868

MILLERS FALLS CO., GREENFIELD, MASS.

of the most significant postwar trends, standardization will cut costs throughout industry.

"This is not theorizing. The plans are already on engineering drawing boards. We have had requests for streamlined, standardized product plant designs for everything from machine tool metals, to house furniture, to steel caskets.

"Existing plants, ranging from thousands built before or during World War I to many built for armament purposes in this war, will no more be able to compete with postwar factories specifically designed for their products than the bow and arrow with the machine gun.

"Many of our older existing plants were erected without *any* plan, merely as sheds to house machines. Other existing factories have grown haphazardly, with buildings, extensions, or lean-tos added here or there until the resulting hodge-podge became chaotic. Still others were pressed into operations for which they were not originally intended; while others are using old-fashioned or inefficient methods because their sites or layouts allow no other choice. Such plants are doomed by the laws of economics. Many appear to be operating successfully only becau.e of war economy.

"In comparison, the new postwar plants will be marvels of efficiency. Particularly the value received per labor hour will be increased. This is a factor of major importance since reductions in industrial wage scales are not anticipated, requiring the most efficient use of labor to maintain reasonable consumer prices.

"To this end, conveyor systems (floor, work-height and overhead) will do away with hauling and carrying. Scientific flow plans will make maximum use of the plant sites, eliminating backtracking or waste movement from raw material to the finished product. New automatic machinery will improve almost all processes, and greatly alter some by the elimination of handwork.

"Improved working conditions will increase output. These will include air conditioning, automatic dust removal, improved lighting, maximum cleanliness, sound proofing, cheerful cafeterias, facilities for instructional movies, arrangements of parking lots and entrance to eliminate lost time between portal and machine.

"The major part of this new building, according to inquiries received, will be devoted to large additions, alterations and conversions at existing plants, but a considerable percentage

An Announcement

OF IMPORTANCE TO OUR

CUSTOMERS IN THE EASTERN STATES

EFFECTIVE as of August 31st, the plants of Empire Finished Steel Corporation at Newark, N. J. and Putnam, Conn. became the Empire Works and the New England Works respectively of Wyckoff Steel Company.

The acquisition of these properties augmented with the facilities of our Ambridge, Penna. Works will provide users of cold finished steels in the EASTERN STATES with the maximum degree of service at all times.

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will consist of new plants. The fabricating field, especially those dealing with new developments, will account for the largest percentage of the postwar construction effort.

"Certain raw material plants, producing steel, nonferrous metals and basic chemicals, will be least subject to change.

"Whatever alterations or new plants are contemplated, postwar engineering is largely being undertaken on the basis of master plans to cover all developments in a given period. Such plans frequently provide for a more or less continuous program of building for a number of years."

Lightweight Mats To Use 45 Million Lb. Aluminum Alloy

Pittsburgh

• • • **The urgent need for** lightwenght airplane landing mats which can be airborne or carried by small cargo vessels into places inaccessible to heavy equipment has been met through the development of an aluminum mat. Weighing half as much as steel mats, it should pave the way for the bombing of Tokyo by facilitating the construction of advance air fields in China, Burma, and the islands of the Pacific.

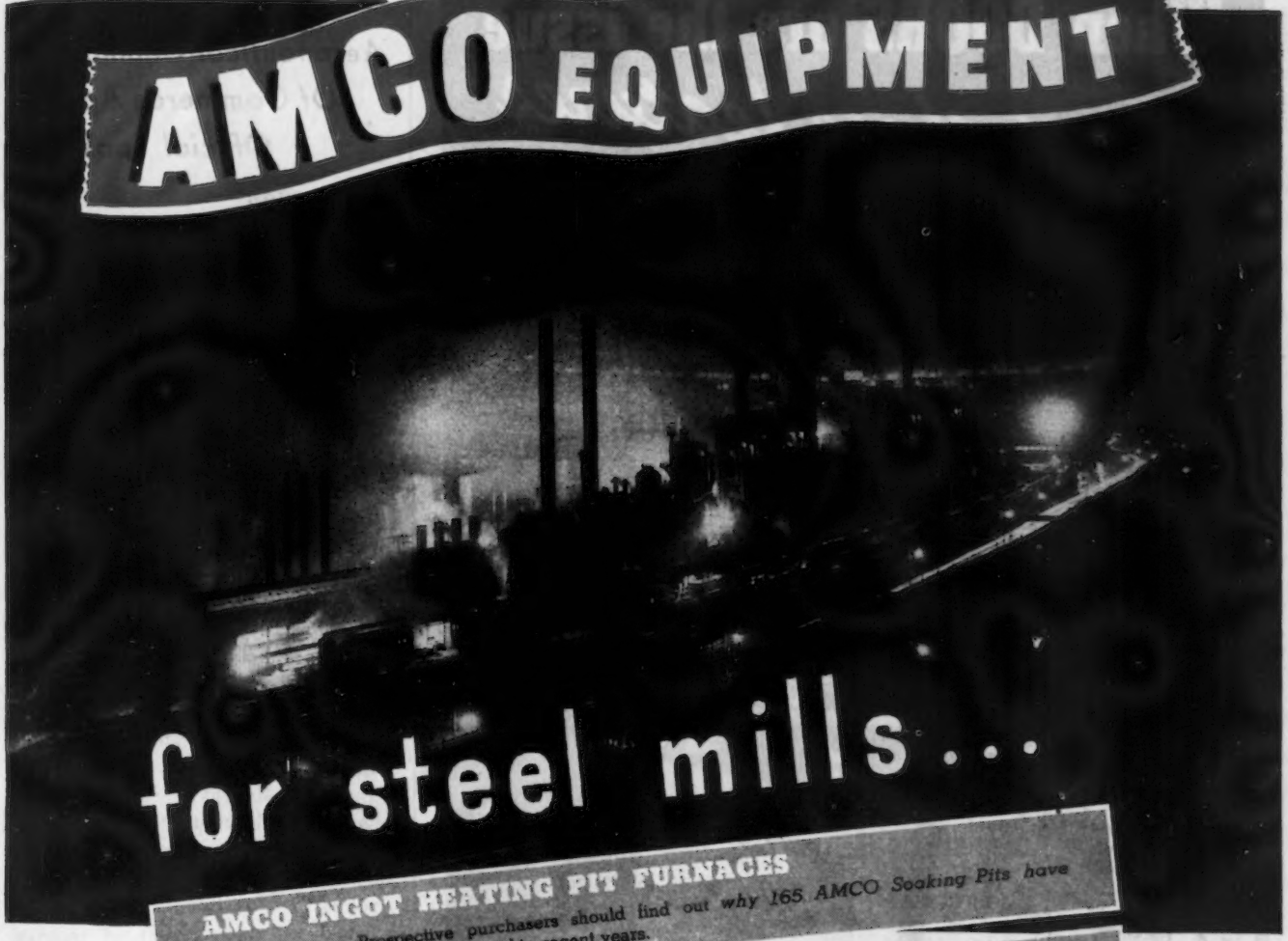
Contracts calling for the manufacture of a total of 12 million sq. ft. of aluminum mats have been let to the U. S. Gypsum Company, Chicago, Illinois, and the United Steel Fabricators, Wooster, Ohio. More than 45,000,000 lb. of aluminum will be used to fabricate the mats.

The aluminum landing mat is built up of a large number of sections, called planks, each approximately 15 in. by 10 ft. and weighing 35 lb. each, instead of 70 lb. for a steel plank. The planks are ribbed and pierced with flanged holes for increased stiffness. Assembly of the planks into a landing mat is effected by fitting adjacent planks together by means of a slide lock known as a bayonet lock.

Aluminum Co. of America was requested by the U. S. Engineers Corps to work with the contractors producing landing mats of steel to develop a lightweight mat possessing the desirable characteristics of the steel mat.

After tests the sheet selected for the aluminum mats was Alcoa 61S-T alloy, 0.188-in. thick, having a yield strength of 35,000 lb. per sq. in. The sheet in the steel mats is SAE 1010, 0.134-in. thick.

AMCO EQUIPMENT



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For reheating plate and forging ingots, slabs, and billets of all sizes—continuous doors where desirable.

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For reheating slabs and billets. Ingots *up to 17" thickness* successfully heated in charging-end-fired furnaces.

AMCO ALL REFRACTORY RECUPERATORS
More than 600 AMCO Recuperators installed in the steel industry during the past 8 years; preheated air temperatures up to within 700° F. of waste products temperatures.

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HERE THEY ARE
Coils overhead out of the way, saving floor, wall, ceiling space.
Motor operation saves time, labor. Permits remote control.
Sturdy, interlocking slat construction for long, dependable service.
Opens straight up. Ice, snow, stored materials don't hinder operation.
Its simplicity of design harmonizes with any architectural style.

You're sure to want these KINNEAR ADVANTAGES

Check these advantages of Kinnear Rolling Doors and you'll find that no other door offers so many outstanding features. Kinnear's sturdy, interlocking steel-slat construction is resistant to intrusion, fire, damage, wear, and weather. The Kinnear Rolling Door coils neatly overhead out of the way of damage, saving floor, wall and ceiling space — it opens straight up, over snow, ice, and stored materials — neat in appearance, it harmonizes with any architectural style. With Kinnear Rolling Doors and Motor Operation — a matchless combination — you simply press a button and the door rises smoothly and easily into a compact coil above the opening. Kinnear Motor Operation also means savings in time and labor, in heating and air-conditioning costs. If you're not already profiting from these advantages, write immediately for full details on Kinnear Rolling Doors and Motor Operation. The Kinnear Manufacturing Company, 1760-80 Fields Avenue, Columbus 16, Ohio.

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SAVING WAYS IN DOORWAYS

KINNEAR ROLLING DOORS

Aeronautical Chamber Of Commerce Appoints Official Spokesman

Washington

• • • In a further move to correlate industry technical activities with those of the Army, Navy, CAA and other government agencies, the aircraft and aircraft engine manufacturers have released a policy statement establishing the Airplane and Engine Technical Committees of the Aeronautical Chamber of Commerce as their official spokesmen to the government on aeronautical technical requirements.

The aircraft and aircraft engine industries are responsible for the design, construction and performance of their products. Hence, they are vitally concerned with the acceptability and proper functioning of all component systems and parts thereof. This was pointed out in a letter by James P. Murray, president of the chamber, directed to aeronautical agencies of the government and to industrial and professional technical groups.

Industry endorsement of technical programs or engineering projects initiated by the various industry organizations can be obtained promptly by channeling such data through the Technical Department of the Aeronautical Chamber of Commerce for consideration by the appropriate engineering policy committees, the letter stated. Projects initiated by the chamber's technical committees will be coordinated with or assigned to those organizations which are best suited to conduct the necessary studies, surveys and analyses upon which recommendations to the government are to be based.

Working arrangements with groups such as the Engineering Committees of the Aircraft War Production Councils, the Society of Automotive Engineers, American Welding Society, Society of Aeronautical Weight Engineers, etc., have been in operation for some time.

The aircraft industry statement, Mr. Murray explained, is consistent with a policy for government-industry cooperation on Army-Navy standards and specifications as developed by the Aeronautical Board earlier this year.

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1. **Weld Metal chemical composition of 42 Arcos Stainless and Alloy electrodes.**
2. **Heat treatment specifications of the welded structure for the more important Stainless and Alloy grades.**
3. **Identifying grade information.**

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Erie, Penna.	Boyd Welding Co.	Rochester, N. Y.	Welding Supply Co.
Fresno, Calif.	Victor Equipment Co.	San Diego, Calif.	Victor Equipment Co.
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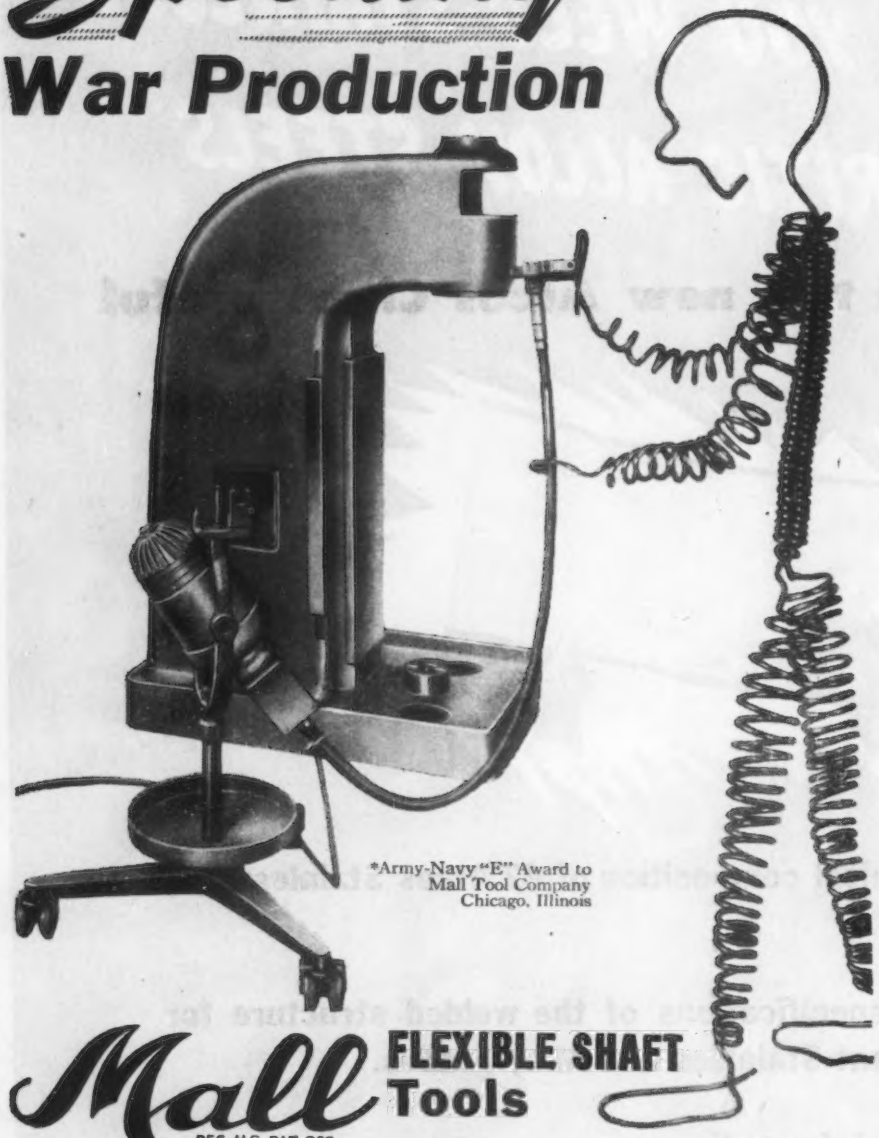
*Speeding War Production



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Important to the war effort is the use of Mall Flexible Shafts in the control of aircraft fuel pumps, tachometers, generators, super-chargers, gun turrets and other vital parts where accurate, positive control is absolutely necessary.

We are proud that special Keystone wire fully measures up to these important applications.

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Metals Society Group To Sponsor Series Of Conference Meetings

Cleveland

• • • **An inventory of information** and developments in the metal industry will be made in a series of 21 practical panel meetings sponsored by the American Society for Metals during the 26th annual National Metal Congress and War Conference Displays in Cleveland's Public Hall, Oct. 16-20. These practical sessions will be in addition to the regular technical lectures of the society.

W. H. EISENMAN

"Headed up by a panel of three to 10 top authorities in specific branches of the metal industry, each of these afternoon and evening sessions will be an audience-participation discussion of timely developments," explained W. H. Eisenman, national secretary of the metals society.

"Headed up by a panel of three to 10 top authorities in specific branches of the metal industry, each of these afternoon and evening sessions will be an audience-participation discussion of timely developments," explained W. H. Eisenman, national secretary of the metals society.

"These meetings will take stock of new technologies developed during the war, will analyze and evaluate production-speeding wartime equipment—all this in a coordinated effort to knit these developments into a compact design for an efficient peacetime tomorrow in the metal industry," Eisenman said.

He listed these subjects for specific discussion during the five-day sessions: Metal powders and products; metals for railroads; metallurgical furnaces; induction heating; heat treatment; manufacture of quality steels; national emergency steels; surface peening; foundry metallurgy; quality control by statistical methods; salt baths; sub-zero treatments; surface finishes and protection; new developments in the study of corrosion; application and use of quality control instruments; tin and tin alloys;

That's what we're shooting for!

Szelepka, Herd, Tallerico, Sauchak, Goldstein, McMahon—maybe it sounds like a Notre Dame line-up. One thing sure—it's All-American. For whether it's at our plant or yours, they are Americans, regardless of their race, color or ancestry.

An equal opportunity for everyone; that's the American way, that's what we're shooting for!

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aluminum; magnesium; metal cutting and tool materials; tools for inspection; and lightweight construction.

With some 200 leaders in the metal industry invited to participate in these panel discussions, Eisenman pointed out that more than 1000 metal men are now participating in the 150 practical and technical talks planned by the five societies taking part in the Metal Congress. In addition to the American Society for Metals, sponsor of the event, these societies are the American Welding Society, the Iron and Steel and Metals divisions of the American Institute of Mining and Metallurgical Engineers, the American Industrial X-Ray and Radium Society and the Society for Experimental Stress Analysis.

Afternoon and evening sessions will be held in Cleveland's Public Hall, scene of the War Conference Displays. More than 325 manufacturers, state and civic organizations are planning exhibits that range from ferrous and nonferrous metals to processes and equipment for their production, fabrication, handling, treatment and use.

WPB's Mica-Graphite Division Clarifies An Erroneous Impression

Washington

• • • To correct an erroneous impression which it said had been created by an earlier press release, the WPB Mica-Graphite Division last week issued a statement to clarify the situation relative to the purchase and sale of metallurgical fluorspar.

It was pointed out that the discontinuance of the Restricted Shipping Plan in no way indicates that efforts toward increasing production of metallurgical fluorspar should be relaxed. It was stated that the market for metallurgical fluorspar is firm and the acid grade is in urgent demand. The press release of Aug. 12 correctly stated, the division explained, that the Restricted Shipping Plan, designed to provide for the equitable distribution of the available supply of metallurgical fluorspar, had been in effect since Jan. 1, 1943, and was discontinued as of that date. This plan, in effect, placed restrictions on consumers' inventories and prohibited the receipt of further shipments when a consumer's holdings exceeded the industry average.

Is This the Most Critical Welding Job?

Note the great depth of the welds.

Two of the forgings from which the shaft was built up.

SMITHway Electrodes in Action . . . *sixteen forgings were welded together with SMITHway Certified Electrodes to make this 15¾-in. diameter, 28-ft. Diesel engine crankshaft . . . one of a number produced by A. O. Smith.*

ARC welding a 15⅜"-diameter crankshaft from sixteen forgings is difficult. The welds are deep. *Good* welds are a *must*, because the shaft is subjected to terrific vibratory stresses, and because the consequences of failure are grave.

A few years ago, the job couldn't have been done. Now A. O. Smith is doing it . . . with especially developed electrodes and techniques.

We can't buy electrodes which meet our exacting requirements for this and other critical jobs. So we make our own. We *know* that these SMITHway Certified Electrodes are uniformly good, because we use 320,000 of them per day in commercial production.

We offer you the same electrodes. They've speeded work, cut costs, and licked the toughest jobs for us. Let them demonstrate that they can do the same for you.

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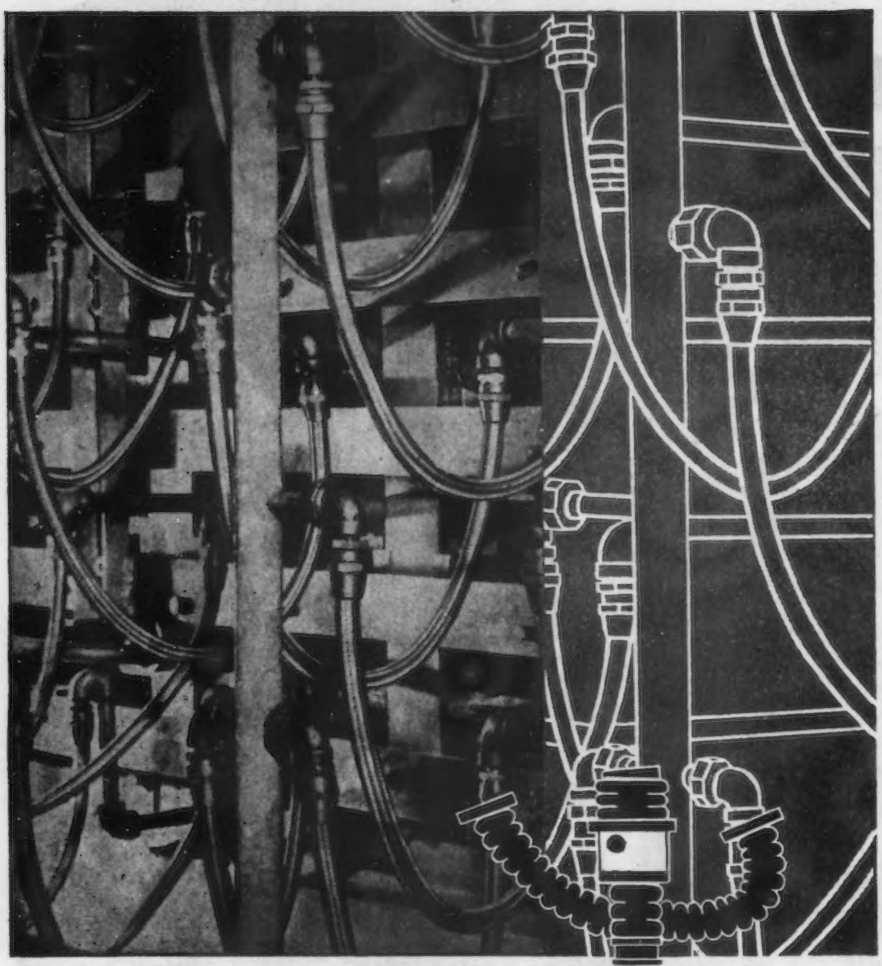
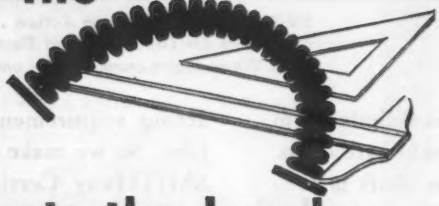


what to do when the

PRODUCT DESIGNER



gets the bends . . .

When the designer wishes to have gases or liquids run around corners, pass from a stationary point to a reciprocating one, or through movable tubes, there are just two things to do:

1. Get Chicago Metal Hose literature for details and data.

Chicago Metal Hose Corporation has a type of product for every requirement of flexible metal hose. For example, Rex-Weld will handle burst pressures to 14,500 p.s.i., temperatures to 1000° F., and liquids that are searching. This and many other types of flexible metal hose and couplings, with specifications, are described in Chicago Metal Hose literature.

2. Ask for a Chicago Metal Hose engineer's recommendations as to the type of flexible metal hose best suited to your particular needs.

Chicago Metal Hose Corporation engineers have had years of experience in helping designers and manufacturers meet all kinds of requirements.

They will be glad to give you their recommendations in connection with flexible metal hose for your products of "tomorrow," or for the improvement of existing ones.

Be sure to write today for literature, or for complete information about the Chicago Metal Hose engineering service.

Flexible Metal Hose for Every Industrial Use

CMH

CHICAGO METAL HOSE CORPORATION

MAYWOOD, ILLINOIS

Plants: Maywood and Elgin, Ill.

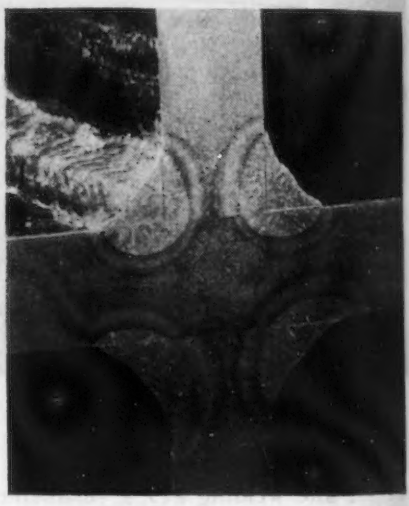
A.C. Arc Welding Story Told in New General Electric Film

Schenectady

• • • A new, natural color sound movie, "The Story of A.C. Welding," has been announced by the General Electric Co. This 16-mm. movie has been made available to all GE arc welding specialists and distributors who will arrange to exhibit the film on request. It requires about 35 min. to exhibit.

Produced by the Raphael G. Wolff Studios, Hollywood, under the technical supervision of the GE laboratories, the film tells the complete story of a.c. welding. Expert welders demonstrate in actual production welding scenes the speed, flexibility and efficiency of the a.c. process in all positions and on all types of joints. Laboratory demonstrations and close-ups of the arc and the molten steel show how the troublesome arc-blow, so characteristic of d.c. welding, is eliminated by the use of alternating current. Animated sketches illustrate some of the more technical points.

Scene after scene depicts how the a.c. process using large electrodes and higher currents results in faster production, easier welding, lower cost and more uniform welds on thick or thin material, in manual or machine welding. The film also illustrates the savings in power and maintenance obtained by a.c. arc welding.



COMPARISON: *This is a scene from the movie "The Story of A.C. Welding" showing a cross section which compares deep-fillet welds (upper right and left) with conventional welds (lower right and left). General Electric technicians supervised film.*

GUESSWORK

can be right, but

TESTING

can't be wrong!

By the time samples from a melt get through the rigorous check-testing that PSF prescribes (in such equipment, for example, as the Izod impact strength tester above, and the Brinell hardness machine at the right) we *know* that the analysis, physicals, and grain structure of the metal will be right for the job you want the casting to do. And for soundness and dimensional accuracy, there is no finer assurance than PSF's advanced foundry techniques give you, amplified by million-volt X-Ray inspection and the most modern machining facilities. PSF works in ordinary or alloy steels, always to a goal of *precision!*

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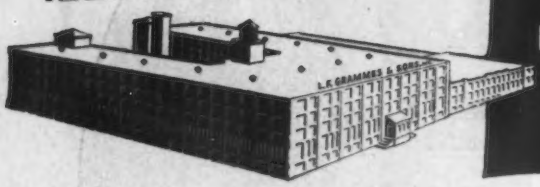
CONTRACT SERVICE BY *Grammes*



Without disrupting vital war production schedules, management can get a head start on postwar production with the *pre-conversion* aid of Grammes Contract Service. Our Research, Design, and Engineering services and facilities are available *NOW* to help solve reconversion problems of *retooling, inadequate plant facilities, inexperienced help, lack of "know-how" in parts-production, development of ideas into new products, and re-designing and improving old products.*

Grammes Contract Manufacturing Service can be your *complete* manufacturing source, providing the all-inclusive services and facilities of "Packaged Metal Engineering"—**in one package . . . in one service . . . we take over* ALL *responsibility, acting as* YOUR *factory from Design Research to Drop Shipments.* Grammes specialized Metal Working Engineers, with more than 69 years of metal fabrication "know-how" plus mass-production facilities, can save you time, money, and materials on your product. Let us quote a "per piece" price on your product.

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Materiel Command Parachute Testing For AAF Never Stops

Wright Field, Ohio

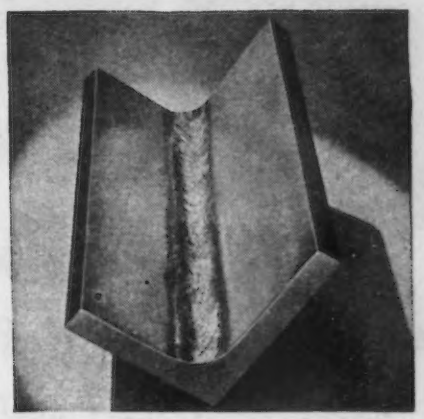
• • • **Headed by Lt. Col. E. Verne Stewart, a veteran of nearly 450 parachute jumps in the Parachute Branch of the AAF Materiel Command carries on the most thorough and continuous experimentation with parachutes of any organization in the world.**

So far as Col. Stewart is concerned, there is only one way to find out if a new parachute, a new harness or a new piece of equipment is any good. Jump it!

Typical of the constant testing, was a recent jump made by Col. Stewart into a lake near here. Equipped with many of the devices carried into combat by AAF pilots, a total of 86 lb. of additional equipment, the Colonel, a non-swimmer, rolled out of a B-18 at about 1500 ft., while a score of technicians, cameramen and observers watched his descent into the water. Included in his emer-

POSITIONED DOWNHAND WELDING ... A Cost-Cutting Production-Boosting POSTWAR MUST

Showing the advantage of position weld - one pass with heavy rod (at left) where two or three passes with a lighter rod would ordinarily be required (at right)



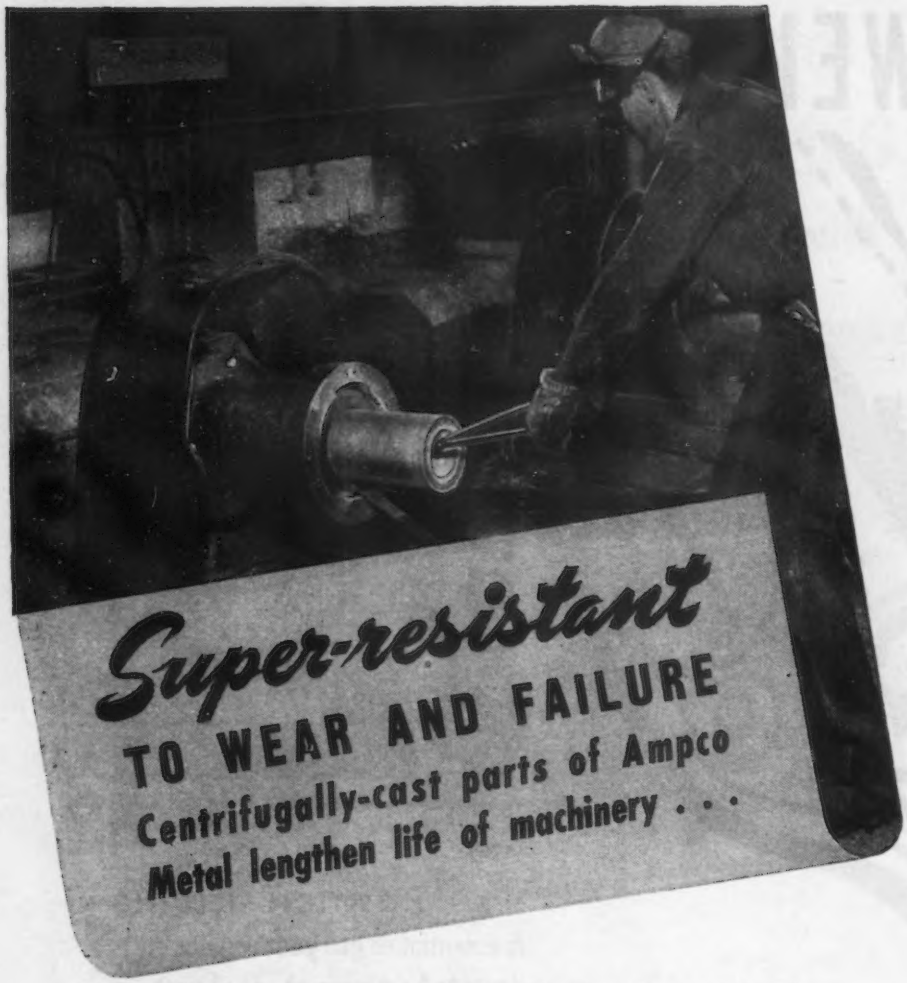
An unretouched weld made in the downhand position . . . a stronger better weld more economically produced

POSITION WELDING is essential to get your welding costs down to be a jump ahead of postwar competition. Submit your welding positioning problems to us or our distributors for recommendations of proper positioning equipment.

Low-cost 500 lb. capacity unit, available either hand-operated or motor-operated

WELDING POSITIONERS RANGE FROM 500 POUND CAPACITY HAND-OPERATED TO 40,000 POUND CAPACITY MOTOR-OPERATED ALSO TURNING ROLLS

INDUSTRIAL DIVISION **Ransome** MACHINERY COMPANY
DUNELLEN, NEW JERSEY
SUBSIDIARY OF WORTHINGTON PUMP AND MACHINERY CORPORATION



To the basic advantage of Ampco Metal — its exceptional resistance to wear, shock, fatigue, and corrosion — the centrifugal casting process adds plus values. Cast under pressures 50 to 300 times as great as in sand casting, Ampco centrifugally cast parts are the practical equivalent of "liquid forgings" — 100% sound (avoiding costly rejections), closer to finished size (saving metal). The Ampco organization furnishes all types of machining . . . rough, semi-finished, or ready for assembly . . . fabricated from an engineered alloy under close metallurgical control. . . . Let Ampco's broad facilities and experience play a constructive part in planning your post-war product. Write for bulletins and services of a competent field engineer.

A-6B

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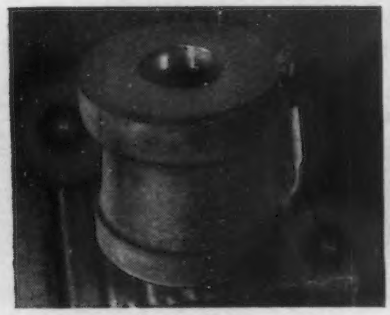

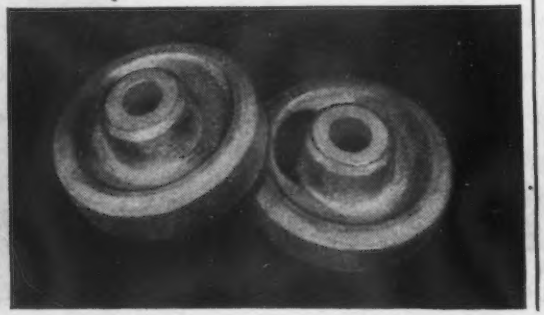

gency equipment were the Peterson life vest, containing some 22 separate items for sustaining stranded pilots, an emergency check pack, Mae West life preserver, and a one-man life raft.

The results of this test were recorded by motion picture cameras, so that all interested parties, including paratroopers, Navy pilots and the AAF could minutely study the details.

The next day, Col. Stewart led a group of eight men in a mass jump from a C-47 over Wright Field. Three types of parachutes were used in order to determine comparative characteristics. In this jump, Col. Stewart broke a bone in his foot, but the information as recorded by the Materiel Command motion picture cameras, and the reports written by the jumpers, has proven invaluable to the AAF.

These two typical jumps were not the first, nor will they be the last to be made by the Parachute Branch of the AAFMC. The parachute is the most important safety device the flyer has and Col. Stewart and his staff will never settle for "good enough." Those words are unknown to the parachute staff, and the Materiel Command will continue to study and improve parachutes, harnesses and all life-saving equipment.

Canadian Trade Is Over Three Billion

Ottawa

• • • Value of Canada's external trade, exclusive of gold, totaled $3,063,480,000 during the seven months ended July 31, $430,235,000 over the corresponding period last year, and highest in the Dominion's history, the Dominion Bureau of Statistics reported recently.

The July total was $430,236,000, against $457,410,000 in July, 1943.

Domestic merchandise exports during the seven-month period were valued at $2,024,980,000, compared with $1,581,408,000 in the comparable period of 1943, an increase of 28 per cent. The July total was $278,713,000, compared with $303,645,000.

Commodity imports during the seven months were valued at $1,012,981,000, compared with $990,567,000, an increase of 2.2 per cent. During July the value was $148,452,000, compared with $150,883,000.

Duties collected on imports during the seven months totaled $103,937,000, compared with $93,798,000.

Better LUBRICATION MEANS Better Maintenance

• Excessive wear and difficult maintenance often result from inadequate lubrication.

Sinclair provides a range of specialized oils and greases for *better lubrication* of *MACHINING EQUIPMENT.* These lubricants together with Sinclair Cutting Oils and Coolants satisfy shop requirements for low equipment maintenance costs and high speed precision output of machined products.

• •

(Write for "The Service Factor" — published periodically and devoted to the solution of lubricating problems.)

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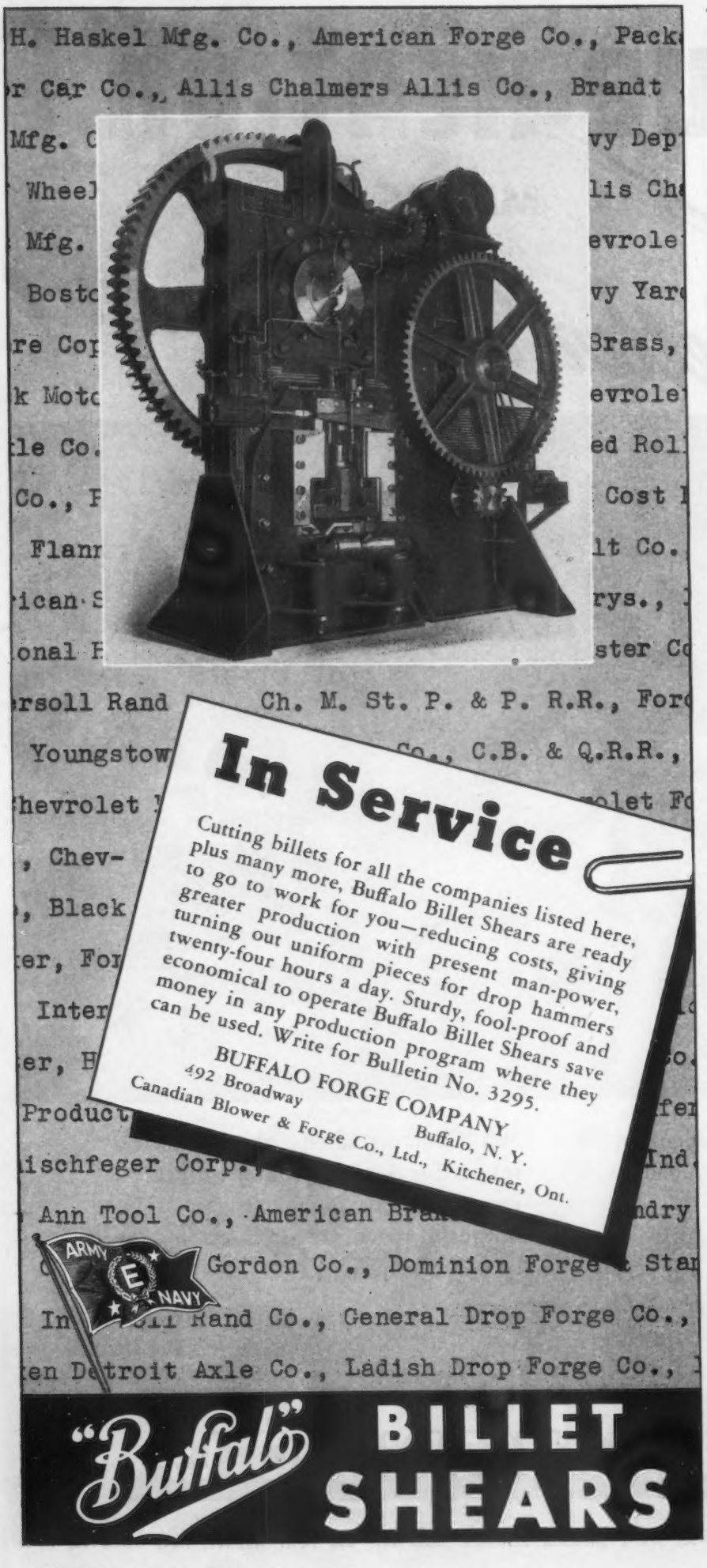


Biggest Bombers To Get Super Power Plants in Future

Lima, Ohio

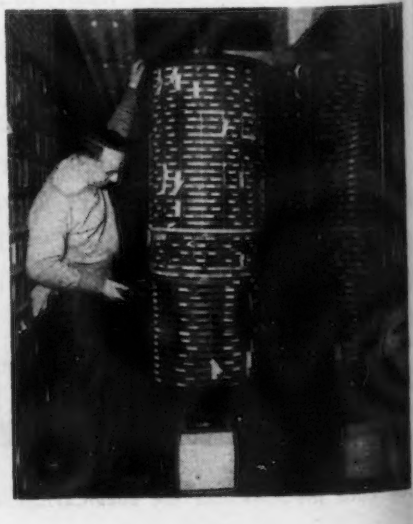
• • • **New "super-power plants," weighing only 85 lb. each yet capable of supplying electrical energy to do the work of 500 husky men, straining every muscle, soon will be riding the skies to victory with America's biggest bombers.**

Alternating-current generators, which operate at higher speeds and therefore produce far more power per pound of weight than the commonly used low-speed direct-current types, now can supply the myriad electrical current demands of large aircraft with increased efficiency. These alternators have been developed and passed stringent tests in the Lima, Ohio, works of the Westinghouse Electric & Mfg. Co., it was reported in a technical paper presented before the recent Pacific Coast meeting of the American Institute of Electrical Engineers by H. E. Keneipp and C. G. Veinott, Westinghouse engineers.

Not only do the alternators, as they are termed by aircraft electrical engineers, do a highly efficient job of generating power for the hundreds of electrical mechanisms on large planes at normal or stratospheric altitudes but there is a possibility that by direct connection of a series of them, one to each engine of a multi-motored craft, exact synchronism of the engines may be maintained, the engineers reported.

While extensive tests of the al-

GAGE RACK: *At General Electric's Fort Edward plant, an employee inserts a snap gage into this tier of circular wooden shelves on a turntable. The rack was designed to use minimum floor and wall space.*



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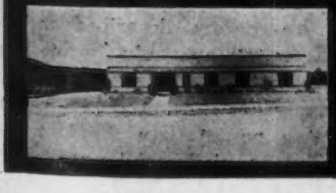


The
METAL SPECIALTY *Co.*

MAIN OFFICE AND PLANT • ESTE AVENUE • CINCINNATI, OHIO

Easy Maintenance Is Built Into Amsco-Nagle Pumps . . . . . .

Ready accessibility for adjustments and repairs is a dividend-paying characteristic of Amsco-Nagle pumps. This feature, in many applications, is as valued by operators as is their ability to handle abrasive and corrosive liquids for maximum periods before requiring attention.

In designing Amsco-Nagle pumps, consideration was given the importance of accessibility for keeping down maintenance costs and reducing to a minimum each "time out" period.

Indicated in the illustration below (P-40-N) are three points of accessibility which add up to savings in time on adjustment and maintenance. This is an Amsco-Nagle 10″ Type "T," frame 29, vertical discharge pump. The type "T" is a single stage, side action horizontal pump of high mechanical and hydraulic efficiency, with wide impeller clearance for free passage of debris-laden liquids, slime, sludge and slurry.

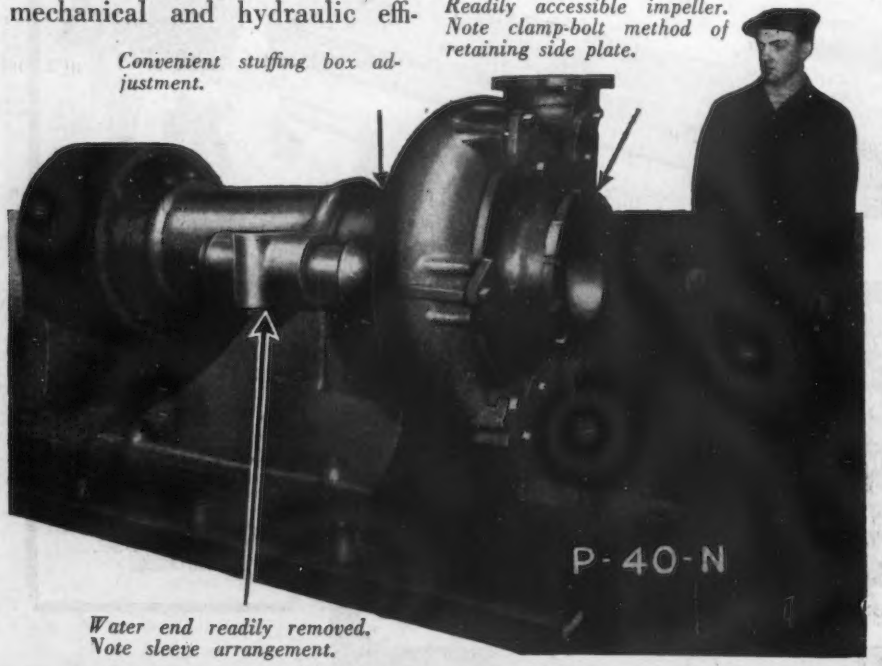
The stuffing box is opened by simply removing the cover cap when adjustment or repacking is needed. Slippage seal adjustment is easily made. The method of mounting the water end on the base, using tube supports, maintains accurate alignment and permits removal of the water end by loosening two bolts. The plate is easily removed by loosening clamp bolts. The impeller screws off.

Amsco-Nagle pumps are made in two horizontal and four vertical types, and in sizes from ¾″ to 16″, for heads up to 200′ and capacities up to 10,000 g.p.m.

Ask for Bulletin No. 940.

Readily accessible impeller. Note clamp-bolt method of retaining side plate.

Convenient stuffing box adjustment.



Water end readily removed. Note sleeve arrangement.

Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois
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ternators have demonstrated that such machines are ready for use in aircraft, one hurdle yet remains to be crossed. This obstacle—expected to be crossed shortly—is the lack of a suitable constant-speed drive from an airplane's motors to give an unvarying flow of power. Since the main engines of aircraft operate over a wide range of speed, some auxiliary means must be provided for driving the alternators at constant speed.

Work toward development of a satisfactory main engine drive system is being pushed and it is anticipated that the problem will be solved. Until then, it is indicated that small auxiliary engines can be used to drive the alternators.

Use of alternating-current generators in aircraft is not entirely new. Rather crude wind-driven ones were used in World War I. Later, and until recent developments in large aircraft brought demand for a much greater electrical current supply, direct-current generators proved more satisfactory. But with heavier planes, need for an electrical plant which could produce greater power, an unfailing source of energy to operate gun turrets, radio sets, instruments, controls, gyro wheels, bomb-bay doors, hundreds of lights and many other devices, became evident.

The alternator is one answer to that demand. Tests showed that voltage could not be increased as safely with direct current. At high altitudes and under conditions of combat damage, such as might be caused by flak or rockets cutting into wiring, high-voltage d.c. systems tend to create hot, destructive arcs which burn away contact points when switches are opened.

Alternating current does not have this disadvantage even at voltages seven times as great as that of the 30-volt power on present bombers. Alternating current is easier to interrupt; moreover, a.c. motors have no brushes and are generally lighter and more reliable.

Alternators, spinning at 6000 r.p.m. to produce 208-volt power, can safely operate at high temperatures. Through a system of blast-cooling, virtually "scooping" up air as the plane speeds ahead and "piping" it over the parts which tend to heat, and through new heat-withstanding insulations, the alternators have been made to operate efficiently.

The alternators described in the A.I.E.E. paper are only 19 in. long and 9 in. in diameter, yet each of the 40 k.v.a. generators produces 30 per cent more power than the two and one-half ton industrial generator.

SCORE

GRINDING 50
MILLING 10

* Another test run won by CORTLAND CHUCKS and SEGMENTS

Here is an unusual Cortland War Production Test Run . . . not against competitive chucks and segments, but against the production time of *milling.*

TEST FACTS: The gun mount division of a great war producer . . . using a Blanchard No. 18 Vertical Surface Grinder . . . Wheel Speed, 750 R.P.M.

WORK: Bearing caps . . . Drop Forgings . . . 50 pieces per table load.

PURPOSE: The purpose of this test was to determine if Cortland Chucks and Segments could grind off .193 stock faster than it could be removed by milling. It had taken 2 minutes per piece in milling.

RESULTS OF TEST: *Cortland Segments mounted in Cortland Chuck ground 50 pieces in 19-1/2 minutes! That's boosting production five times!*

Much of your milling work may be ground . . . perhaps at greater speed and lower cost . . . certainly with required accuracy—when you use Cortland Chucks and Segments. Why not call in a Cortland Grinding Engineer to discuss the matter . . . or write for latest illustrated bulletin, giving complete details of Cortland Chuck and Segment performance.

CORTLAND GRINDING WHEELS CORP.
7 Cortland Street Chester, Massachusetts

Diagonal Shearing with Varying Contact Means Better Surface Grinding

A true segment, the grinding surface has narrow ends that *start* the work with minimum shock and resistance. Straight inner edge of segment passes diagonally across work with a *shearing* action that *cuts* and *removes* the metal. Varying contact area insures longer exposure to coolant—decreases heat—reduces segment wear—conserves power.

CORTLAND
Chucks and Segments

SPECIALIST IN GETTING THE "BUGS" OUT

Merely saying, "Ideas are dandy — let's have yours," isn't enough to get employes to suggest improvements in products, methods or processes.

One reason the Morton Suggestion System has worked so well in over 10,000 installations in 16 years is the specific nature of the appeals it uses. "Getting the bugs out" is just one important line along which the Morton Suggestion System guides creative employe thinking.

Proved, resultful appeals are one of many features that enable this expertly planned idea producer to work anywhere, anytime. Even though you now operate your own, it will pay you to investigate the Morton Suggestion System. Its ability to raise employe morale, improve quality of ideas and more than pay its way, can be extra valuable in the period just ahead.

Get the cost-free details immediately. Simply drop us a line — we'll do the rest.

MORTON MANUFACTURING CO.
SUGGESTION SYSTEM DIVISION
349 N. Leamington Ave., Chicago 44, Ill.

Forecasts Decline In Postwar Air Rates Following Study

Buffalo

• • • A decline in postwar air transportation rates, gradual at first and then accelerating, is forecast by Dr. D. H. Davenport, director of business research, Curtiss-Wright Corp., Airplane Division, Buffalo, N. Y.

Numerous improvements in service, a tremendous increase in air travel, and better equipment also are anticipated by Dr. Davenport in a discussion of "The Future of Air Transportation," in which he summarizes the findings made in a study, "Air Transportation in the Immediate Postwar Future," by the Business Research Department of the Curtiss-Wright Airplane Division.

Dr. Davenport said it has been estimated that within five years after the war, domestic passenger rates will have declined from the prewar average of 5.1 cents per mile to 3.5 cents a mile, and express rates from the prewar 80 cents a ton-mile to 30 cents a ton-mile.

Numerous improvements in service may be anticipated to the advantage of passengers and shippers alike, Dr. Davenport pointed out, adding: "With the full application of wartime developments to peacetime air transportation, the number of accidents is expected to be so low that fear of travel should be eliminated entirely as a deterrent to air travel.

"Flight cancellations should be virtually negligible, and almost 100 per cent schedule performance may be expected," he continued. "Furthermore, the addition of lights and the extensions of service to many points not now served should make air travel as convenient as train travel. Finally, improvements in aircraft design and interior appointments may be counted on to add greatly to the comforts of air travel."

As a result of these influences, the Curtiss Airplane Division Business Research head pointed out, domestic air travel five years after the war has been estimated at approximately seven times that of 1940—700 million passenger miles as against 104 million. Express, he said, is expected to show an even greater rate of increase—from 3.5 million ton-miles in 1940 to 110 millions five years after the war; while mail is estimated at 87 million ton-miles as compared with 10 million in 1940. Comparable rates of increase are expected in international air traffic.

"Even with the increases estimated above, air transportation, five years after the war, will still be a small part of total traffic," Dr. Davenport said. "As rates continue to decline, however, and approach competitive carriers' rates, the effects of the many indirect economies afforded by air transport will begin to be felt in increasing force and air cargo should increase at a rapidly accelerated rate.

"Rapid transit makes possible savings in inventories, in interest charges, in insurance, in packaging and in handling; these savings may not appear important when there is

POSTWAR COMMITTEE: *Members of Curtiss-Wright Corp. Postwar Committee developing plans for peacetime production at a meeting in Buffalo. (Left to right): C. M. Leeds, Wright Aeronautical, Paterson, N. J.; James C. Willson, Curtiss-Wright Vice President and committee chairman; Dr. D. H. Davenport (standing) Airplane Division Director of Business Research; Peter F. Rossman, General Manager Development Division, Bloomfield, N. J., and Prof. Edmund D. McGarry, Business Research Consulant. Oscar Nelson, Propeller Division, is also on the committee.*

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Unless the surfaces of the zinc alloy die castings, zinc plated parts, galvanized or other products on which you are using the Cronak process or similar chromating techniques are first made chemically clean, it is impossible to obtain a satisfactory, uniform and lasting finish of the desired corrosion-resistance.

Grease, shop dirt and similar foreign matter must FIRST be removed . . . and here is where specialized Oakite materials and procedures will prove unusually effective. Not only do they RAPIDLY, completely rid zinc surfaces of these accumulations, but they do the job SAFELY . . . leave zinc coatings unharmed. A trial will convince you that they are QUICK-ACTING, easy-to-use . . economical, too.

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OAKITE Buy Bonds for Victory
specialized cleaning
MATERIALS & METHODS FOR EVERY CLEANING REQUIREMENT

a differential of 15 or 20 cents per ton-mile between air and surface rates, but may well be critical when that differential has been reduced to a few cents."

The Business Research Director said it is estimated that approximately 1500 planes will be sufficient, five years after the war, to meet the requirements of U. S. air carriers operating domestically and internationally, as well as the requirements of foreign operators in certain foreign areas which may be accessible to U. S. manufacturers.

He pointed out that in 1930 there were 497 planes in use in domestic air commerce. In 1940 the airlines carried 13 times as much traffic as in 1930 but with 330 planes. In 1943 the airlines handled 50 per cent more traffic than in 1940 with about half as many planes.

"The answer to this apparent contradicition lies in two factors—increased size of planes and increased performance due to greater speeds, greater load factors and higher utilization," Dr. Davenport said. "Postwar, the trend of greater size and better performance will undoubtedly continue. Consequently the increase in the number of planes is not expected to be as great as the estimated increase in traffic."

There is nothing to indicate, Dr. Davenport said, that giant planes carrying 150 to 200 passengers will be a common sight on the airways in the immediate post-war years.

"In the first place," he pointed out, "it may be at least several years after the war before even a single plane of that size will be available to the airlines. In the second place, it probably would not be possible to give the desired frequency of service and still maintain economical load factors with planes of that size for at least a number of years to come."

Dr. Davenport reported it was estimated that medium, trunk-line planes of 30 to 40-passenger size would best suit the requirements of the bulk of traffic during the immediate post-war years.

The study which he summarizes was made to aid the Airplane Division in its planning for the post-war production and sale of peacetime Curtiss Commandos.

"After the war," he said, "Curtiss-Wright plans to be an active and important producer for the commercial airplane market as well as for the military. The C-46 Commando—originally known as the CW-20—was in fact originally designed as a commercial transport, but was converted to a military model after the war. Our plans for competing in the commercial market are, therefore, not new."

He pointed out the extensive, rugged wartime duties of the Commando, adding: "The result is that the post-war commercial counterpart of the C-46 Commando will be a proven ship, and a vastly improved ship because of the ruggedness and simplicity that we have had to build into it.

"The competitive prospects of the Commando in the post-war market, it was concluded, appear excellent from at least two points of view. First, since the Commando can be designed to accommodate from 36 to 44 passengers, it seems to be well adapted to the bulk of the traffic with respect to size. Second, it was estimated that, based on 1940 experience, the greater part of post-war air traffic will be comparatively short-haul. (In 1940, 85 per cent of air traffic was carried on hops of 600 miles or less.) Since the Commando is most efficient at medium ranges, it appears well adapted from an economy-of-operations point of view."

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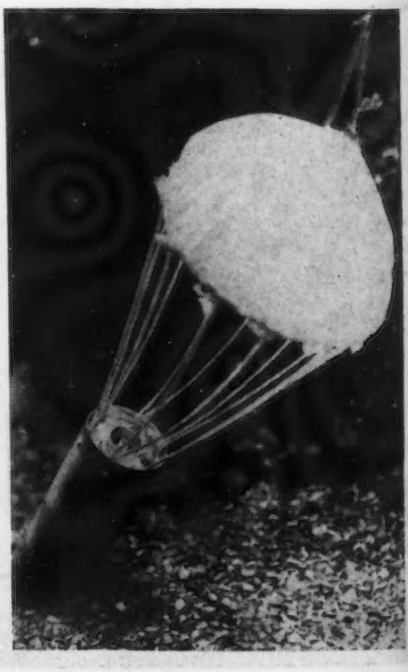

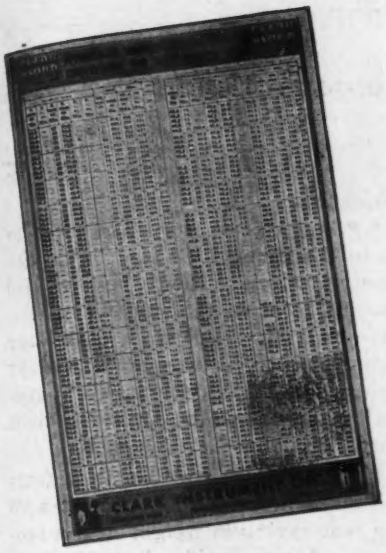

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New Aircraft Material Identification System Replaces Color Code

Washington

• • • **A new uniform** identification system for materials used in aircraft manufacturing, to replace the outmoded and generally unsatisfactory color code plan, has been developed by the National Aircraft Standards Committee of the Aeronautical Chamber of Commerce of America. It is based on ideas contributed jointly by the Army, Navy, the aircraft industry and the American Iron and Steel Institute.

Final approval of the newly evolved source marking system is expected at the special Army-Navy-Industry Conference which will be held Sept. 19, at the Hotel Lexington, New York. It has already been endorsed by Army and Navy officials as a procedure which will simplify their problems of stocking materials in the field.

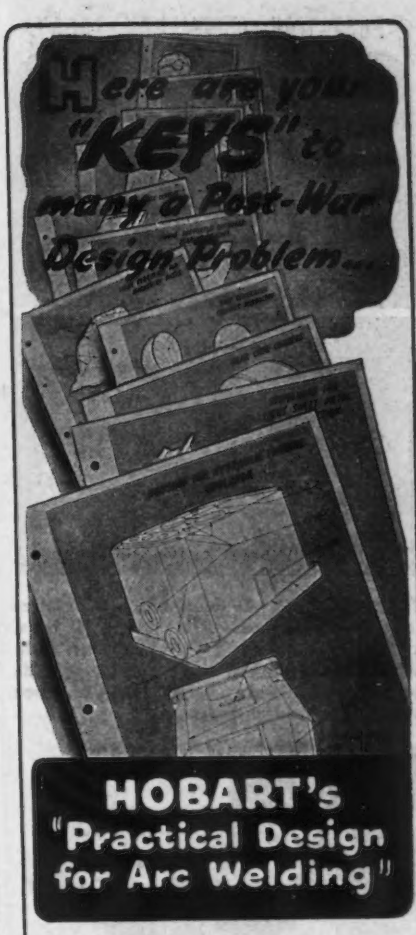
The proposed system consists of a printed legend stating the AN specification number and condition, the nominal thickness, steel manufacturer's name or trademark, and the commercial designation (optional), to be used for identification marking of steel sheet, bar, wire and rod.

Industry sources believe that because of the time-saving and economy features, some mutually satisfactory version of the system may be put into effect in the immediate future. Heretofore, lack of a standardized system of source marking and the inadequacy of methods used by individual aircraft manufacturers has caused the diversion of thousands of man hours and has necessitated the conduct of extensive tests and chemical analyses of materials which otherwise would be returned to the mill as scrap.

Publication Appears Under Different Name

New York

• • • **On Sept. 1** a Western Electric publication well-known to the radio industry before the war as "pick-ups" once again makes its bow under the new title *The Western Electric Oscillator* Including a bright cover done in the war theme by artist Paul Rabut, the publication presents 36 pages of technical and allied information of interest to broadcasting and electronic people. The editor is Will Whitmore with Vance Hilliard, assistant.



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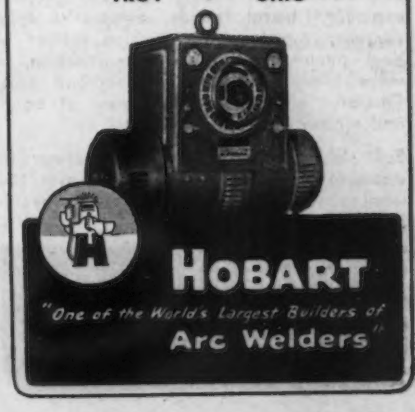

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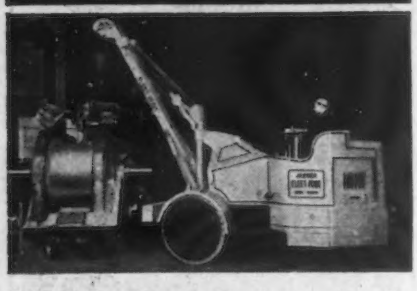

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Battelle Institute To Study Corrosion Of Pipe in Oil Industry

Columbus, Ohio

• • • **The serious corrosion of pipes** and fittings of high pressure condensate wells, which has cost the petroleum industry hundreds of thousands of dollars, will be studied by Battelle Institute, Columbus, Ohio, under a research program recently initiated for the Natural Gasoline Association of America.

Sponsored by producing companies of the Southwest, the program is a cooperative effort to determine the cause and means of eliminating one of the most baffling corrosion phenomena ever encountered by the industry. First reported two years ago, the corrosion has since been found in a large number of condensate fields and has defied all individual efforts of remedy.

Occurring as it does in high pressure wells, most of which range in depth from 7000 to 10,000 or more ft., this corrosion creates an unusual hazard, it was declared. The corrosion is all internal and cannot be observed except by teardown inspection. It is not continuous throughout the well fittings but is spotted at unexpected locations in the surface connections or may appear 400 ft. down the tubing. In some cases, destruction of fittings has been so rapid that replacement has been necessary within 90 days, while in others the corrosion has been at a much slower rate. Repairs on some wells where the tubing has failed because of corrosion near the top have cost from $50,000 to $70,000 per well.

According to William F. Lowe, secretary of the Natural Gasoline Association of America, it is expected that the project will be continued for at least three years because of its particularly baffling and complex nature. The annual budget has been set at $20,000, which is being raised by subscription among interested companies.

According to Mr. Lowe, the laboratory work at Battelle will be supplemented by full-scale experiments in the field. The data and activities of the research groups will be coordinated by a central Corrosion Research Project Committee, which will also serve as a clearing house for corrosion research data developed by individual companies, the U. S. Bureau of Mines, and the American Petroleum Institute.

Large Propellers In Service Tests At Curtiss Electric

Caldwell, N. J.

• • • **The largest propellers** ever to fly in this country, 18 ft. 2 in. Curtiss Electrics which efficiently harness 3000 hp. and more in the substratosphere, have been in service tests on a large Army bomber, it was announced by Robert L. Earle, vice-president-general manager of the Curtiss-Wright Corp., Propeller Division, here.

Despite their record size, these four-blade hollow steel giants effect a 20 per cent saving in weight over a propeller of comparable diameter with four solid aluminum alloy blades and increase the useful load of the airplane approximately 650 pounds through this weight reduction.

Probably the largest aircraft propellers in flight in the world, they offer the unmatched durability of hollow steel blades yet are lighter than many smaller diameter propellers using aluminum alloy blades.

Two other exclusive Curtiss-Wright propeller features, reverse thrust and automatic synchronization, are embodied in this installation. With the latter, the four propellers and engines are held in perfect synchronization by a single control. The propellers also are capable of fast feathering under all climatic and altitude conditions.

The hollow steel blades, each 8 feet 8.5 inches in length and 15 inches at the widest point, are of special design and construction.

Through the use of a stiffener rib running longitudinally the length of the inside blade surfaces, Curtiss-Wright engineers have successfully overcome the problem of high vibratory stresses normally encountered in blades of large proportions.

The design for this basic 18 foot propeller has been under development by the Propeller Division engineers, in cooperation with the Army Air Forces Materiel Command, for approximately three years. A three-blade version of this design, 16 ft. 6 in. in diameter, was flown for the first time in July, 1942, and is now in service on the Navy's record-breaking cargo transport, the Martin Mars.

It is expected that the new 18-foot propellers will see service on many yet unannounced military and transport aircraft.

This announcement follows the company's disclosure on July 28 that it is now engaged in turning out 16 ft. 8 in. propellers.

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NEWS OF INDUSTRY

Ships Are Lifted Out of the Water At Federal Yard

Kearny, N. J.

• • • **Ships don't** stay launched here but "get a big lift" out of the water in the dry dock where the underwater section of the hull is dressed and completed for delivery by U. S. Steel's Federal shipyard. The dry dock will prove equally useful in the postwar period for ship conversion and repair.

More than fishing tackle naturally is needed to raise large tonnages of steel, such as Naval auxiliary cargo attack vessels, destroyer escorts, and destroyers. Ships towed to the dry dock by tugs and then pulled by winch between the steel wing walls while it is submerged are lifted as if they were aboard an elevator in a modern office building.

Operation of the "lift" or dry dock is somewhat on the principle of the submarine. The base of the Kearny dock is composed of nine pontoons, each 110 ft. long, 40 ft. wide, and 13 ft. deep. They are made of wood and are held together by continuous steel wing walls on each side.

Atop the walls are controls for opening and closing valves in the pontoons, each of which is equipped with electric pumps, one at each end. Just as a submarine takes in water to sink, so do the pontoons of the dry dock. Water is pumped out to give buoyancy, as in the instance of the U-boat. Buoyancy is the big boost that lifts the ships. When the dry dock with a ship aboard has raised to the required height and level, the valves in the pontoons are closed so the dock will hold its position.

Destroyer hulls are spray-painted while they are drydocked and the propellers attached. The hulls of destroyer escorts are sandblasted and coated with non-corrosive plastic paint. Those of attack cargo vessels are treated similarly. Then the ships are returned to the water and delivered to the Navy for commissioning and action.

Eases Rubber Machinery

Washington

• • • **WPB has announced** that manufacturers of rubber processing machinery and equipment may fill, as unrated orders, any orders that are not authorized on Form WPB-1277 provided they do not interfere with the production or shipment of orders specifically rated on that form. This action was taken by amending L-143-a.

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CARE ... how to protect the blade when not in use ... keep in box, or hang on nail out of way of possible damage from careless handling.

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Lack of Inland Transportation Reduces British Steel Production

London

• • • In Parliament recently, Capt. Rt. Hon. Oliver Lyttelton, British minister of production, was handed a poser. The question: "Why are British and Scottish steelworkers being dismissed from the steel works while Great Britain continues to place large orders in the United States for steel ingots?"

According to the *Iron and Coal Trade Review*, this curious situation is caused largely by the tie-up of British inland transportation which at present is being utilized to supply the vast demands of the Allies advancing into the Reich.

Mr. Lyttelton, admitting that the situation was extremely complicated, said that the limits imposed by the availability of steel-making materials along with other factors prevented the full use of available British steel capacity.

"Any cut in production," he continued. "which has taken place has been very small and uniformly applied in all of what were depressed areas, in the light of transportation considerations and in view of operational demands."

Discussion in parliament disclosed that the personnel in the steel industry in Scotland has been reduced by 13 per cent in the last six months, but Mr. Lyttelton apparently settled the question by announcing that "reduction of production is trifling."

On the question of whether the present situation caused by the non-existence of inland transportation could be considered an "ominous" sign of what will happen to the British steel industry when peace comes, the production minister said indignantly, "I should very much hope not."

It was also pointed out that the importation of semi-finished steel from the United States was particularly feasible at this time as use of such material would eliminate the necessity for at least two-thirds of the vitally needed transportation facilities for domestic steel production.

Canada Approves Export Credits Fund

Toronto

• • • As a preliminary step toward bolstering Canada's external trade in the postwar period, it is announced that the government has approved an Export Credits Fund totaling $300,000,000, which is understood to be the forerunner of a much greater sum for this purpose.

According to information from government sources, the first use of this fund will be the underwriting of a loan of $25,000,000 to Russia for the purchase of electrical machinery and equipment. The loan, it is stated, already has been arranged through Canadian banks so that the government guarantee will merely underwrite the commitment. It was announced several months ago that Russia was prepared to place large orders with Canadian manufacturers for electrical machinery and equipment. Some difficulty arose because the order could not be handled under Mutual Aid because it involved postwar type of materials and delivery could not be made in wartime.

However, the deal with Russia was completed and the financing arranged through Canadian banks on the understanding that the government would take steps toward extending the kind of postwar credits which have been found necessary where nations had not the funds with which to purchase materials and supplies which Canada could produce or manufacture. During the war these goods have been distributed to Allied countries with few or no strings attached. For the postwar period and to stimulate export trade new arrangements are required to underwrite foreign trade, and this now is being supplied on a modest basis by the Export Credits legislation passed in the closing sessions of parliament.

The new act sets up an Export Credits Insurance Corporation with authority to incur liability on insurance contracts issued up to $100,000,- the act are found in section two, 000. The more significant sections of which authorizes the government (a) to guarantee export credits up to $200,000,000 and (b) to make actual loans up to $100,000,000.

Aims and Aspirations Of CED Postwar Plans Seen as More Popular

New York

• • • **Current favorable war news** is doing much to smooth out what has often been a rough road for the Committee for Economic Development, or CED, over the past two years. The CED deals in postwar planning which is a much more "popular" item, now that enemy strongholds are toppling like tenpins. But in the fall of 1942, when a group of businessmen met to form a committee for "economic development," it took the "long view" to see ahead to the day of victory. Then it wasn't even safe to go fishing off Long Island Sound for fear of Nazi subs, and Rommel was only a short tank ride from Cairo.

But just as the war has come a long way since El Alemain, so has postwar planning. Today there are 2000 CED community committees located in towns and cities throughout the country. Some 50,000 businessmen are members of these committees.

The primary objective of each one of these community CED's is to stimulate local employers, large and small, to have their individual postwar plans *ready* for V-day. And in making these plans, the CED urges each businessman to plan not only to have ready his plans to *reconvert*, but also plans to *expand*, and thus create *new* business activity and *new* peacetime jobs. This is in keeping with CED's basic philosophy that there is only one kind of postwar currency that will really pay off—and that is *jobs*.

Altogether, CED believes that plans should be made for an increase in production and business activity of 30 to 45 per cent over 1940, which, in turn, would provide between 7 and 10 million new jobs.

At the same time that individual business employers are making plans for more jobs in their own companies, the CED believes that we should be opening a "second front" of postwar planning by tackling some of the broad national economic problems which will affect the success of all planning—problems such as taxation, demobilization of wartime controls, postwar finance and credit regulations, etc. While these are primarily matters of government regulation and control, the CED nevertheless, believes that their solution will demand the best thinking and democratic action by all groups in the economy. Accordingly, the research division of CED has sponsored major studies on some 20 vital economic problems which will seriously affect the postwar plans of individual businessmen, and of the country as a whole. Among the problems under study are: Removing wartime economic controls; financing the reconversion and expansion of business; manpower demobilization and reemployment; money and banking policy during transition, and agriculture after the war.

Out of CED's dual approach to postwar planning—(1) the stimulation of individual business planning at the grass roots; and (2) the national research program—come two types of literature which are of use and interest to individual businessmen. One is a series of handbooks or pamphlets on *specific* planning operations. Among these are three how-to-do-it handbooks giving "cook book" instructions and suggestions on postwar planning for (1) industrial companies; (2) retailers; and (3) wholesalers. These three down-to-brass-tacks guides were prepared for CED by the Association of Consulting Management Engineers. They are not "promotion" literature, but rather are prepared for the businessman who wants to know, "Where do I start and what do I do next in drawing up a postwar plan for *my* business?"

These handbooks are available to individual businessmen through any of the 2000 local CED Committees, or directly from the national office at 285 Madison Avenue, New York.

In addition to this handbook type of material, the CED research program, which has been under way for more than a year and a half, is beginning to bear timely fruit in the form off: (1) research reports prepared by the individual research experts which have undertaken specific projects; and (2) statements on national policy, which are issued by the research committee, setting forth the recommendations of the CED for action in attacking these problems.

Two CED Research Reports have been published to date: "Production, Jobs and Taxes," by Harold M. Groves, Professor of Economics, University of Wisconsin; and "The Liquidation of War Production," by A. D. H. Kaplan, Professor of Economics (on leave), University of Denver.

The CED research committee has issued important statements on policy on these same subjects.

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MACHINE TOOLS

. . . News and Market Activities

OPA Price Rule Includes Discounts

Washington

• • • **Effective Sept. 12,** manufacturers' maximum list prices for new machine tools that are priced on the basis of a comparable machine tool made by the same manufacturer must be adjusted to reflect the resale discount allowed to dealers or agents. This action was taken by OPA and places a new machine tool that is comparable to others produced by the same manufacturer under coverage of the provision for resale discount found in the regulation governing prices of new machine tools—Maximum Price Regulation 67. Because the computation is based upon current costs, OPA said that the new method of computing costs for a modified machine tool will protect the manufacturer from loss resulting from possible increases in labor and material costs since the base date.

Previously, the price of the new tool was related to the established price of the comparable machine tool. The variation in the cost of the new or modified tool was limited to factory or manufacturing cost. No additional markups for general and administrative expenses and profits were allowed. These cost items were limited to the amount already included in the price of the comparable basic machine.

The amended regulation continues to limit the manufacturer to factory costs. However, by computing the resale discount and adding it to the list price of the modified machine tool where the price is increased, and subtracting it when the price is decreased, the factory cost, OPA said, is more equitable and more successfully figured than under the original method.

OPA cited the following example of computing the cost of a new or modified machine tool under the new method: A nearest comparable machine tool has a list price of $2500 and a 10 per cent dealer discount, which gives the manufacturer a net price of $2250. If the factory cost change is $225 the manufacturer may add $25 to it, which allows for the 10 per cent discount.

The list price based upon this example will be:

Where the cost is increased:

List price, $2,500, less 10 per cent equals $2,250, net price.

Plus $250 less 10 per cent equals $225, factory cost increase.

New list price $2,750 less 10 per cent equals $2,475, new net price.

Where the cost is decreased:

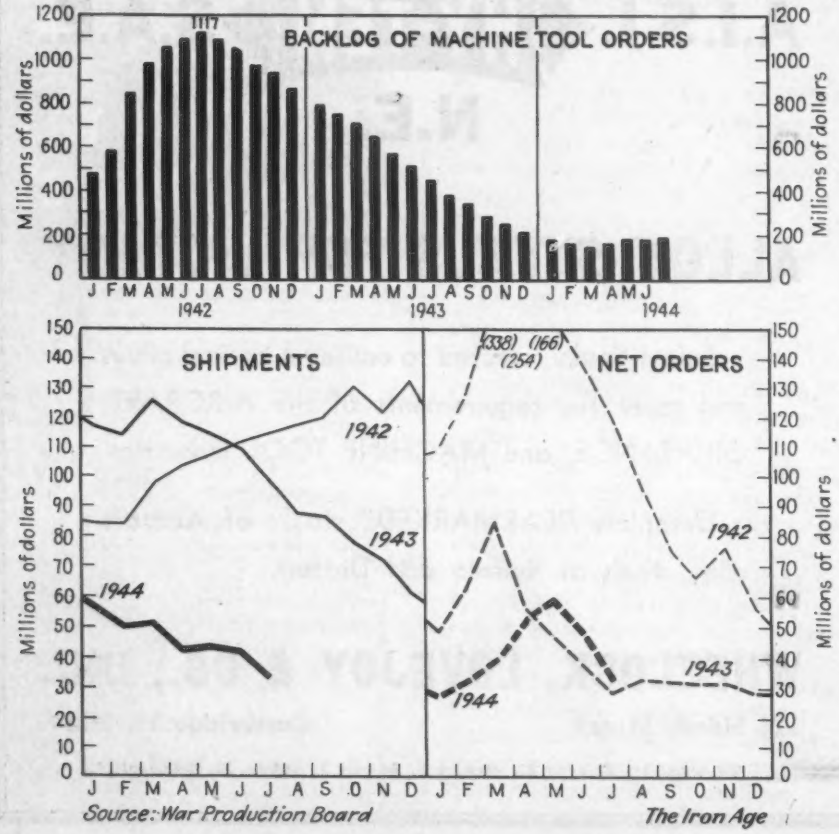
List price, $2,500, less 10 per cent equals $2,250, net price.

Plus $250, less 10 per cent equals $225 factory cost decrease.

New list price $2,250, less 10 per cent, equals $2,025, new net price.

Machine Tool Shipments Declined 18.2% in July

Shipments of machine tools in July were valued at $33,916,000, a decrease of 18.2 per cent under shipments in June, which were valued at $41,471,000, according to the WPB Tools Division. The value of July net firm orders—total firm orders received less cancellations—decreased to $33,224,000 or 33 per cent below the June total of $49,578,000. The backlog of unfilled orders at the end of July was $194,588,000 or 0.1 per cent over the June backlog of $194,450,000.



Backlogs to Maintain Production Well into 1945

Cincinnati

• • • **Machine tool bookings** are steady at a modest level but this is not yet affecting operations since backlogs will maintain production into 1945. Builders are active in postwar planning committees to assure good business following hostilities but no plans have become sufficiently crystalized to announce.

New Crucible Handbook

New York

• • • **A handbook on** crucible melting has just been issued by Crucible Manufacturers Assoc. Illustrated throughout its 16 pages and cover, the book is a treatise on crucible furnaces, and the storing, handling and use of crucibles. Printed in pocket-size, and written to help the foundryman get the best results from his crucible furnaces, the book will be a practical refresher for the long experienced man and a valuable aid to those newer in the work. A copy may be had by addressing Crucible Manufacturers Asso., 90 West Street, New York 6, N. Y.

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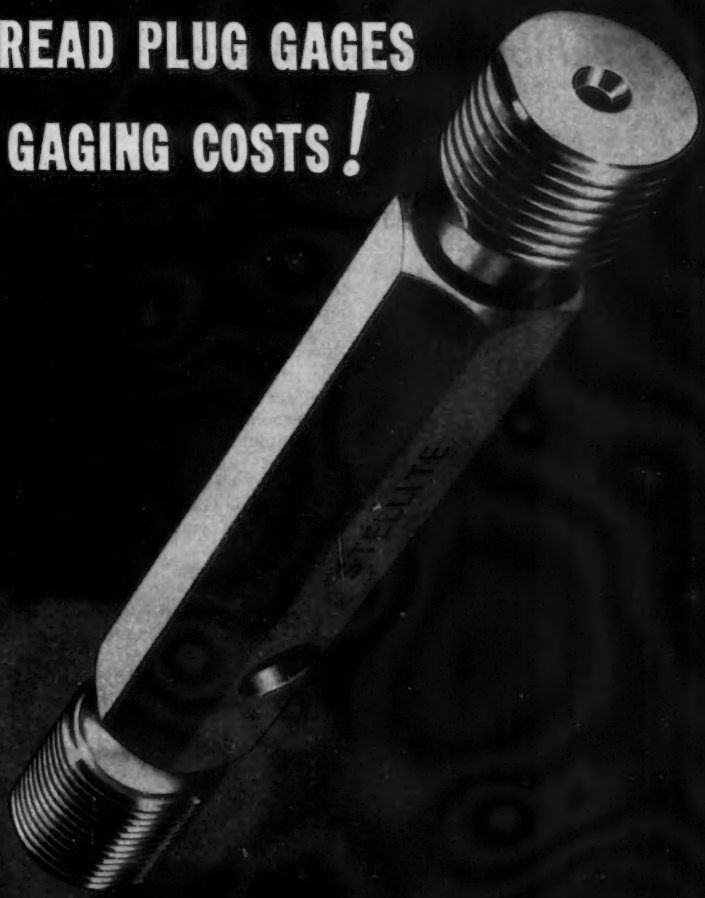

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Markets Exhibit Further Weakness

New York

• • • **The decline in scrap prices continues this week with lower quotations on many grades in almost every district. Those districts which lead the decline, Detroit, Philadelphia and New York, show further drops this week. In Pittsburgh and Chicago, key districts, scrap prices are down $1 to $2 a ton. While there have been few sales prices are lower on the basis of firm offers to sell by brokers and dealers. This readiness to sell at the quoted prices reflects not only the weakness in scrap prices but also**

See page 123 for Scrap analysis.

shows that order books are slim and action has almost ceased with some brokers and dealers. Substantiating the lower quotations on No. 1 steel at the major centers is the news that railroad scrap has sold below ceiling at prices generally about $1 a ton higher than No. 1 steel quotations at major centers. The move of one large consumer to force differentials between No. 1 steel and No. 2 steel is further reflection of "free market" tendencies.

PITTSBURGH—Scrap prices this week in Pittsburgh, Cleveland and Youngstown are practically impossible to determine on the basis of sales made, since in many instances there have been no sales and none are expected. Consequently in the price listings for these cities, dealers' asking prices have been noted. It may be observed that these prices are substantially down from the quotations of last week. Bethlehem is believed to be trying to establish a differential between various scrap grades. Differentials of $1 a ton for No. 2 heavy melting, $2 a ton for No. 2 bundles, and $4 a ton for No. 3 bundles are Bethlehem's objectives, but only time will tell whether or not they will be successful. The current laxity of buying in the scrap market, with its effect of depressing prices, might have one good effect. As these prices are lowered they more nearly approach levels to which they will drop on victory day, and a drastic drop such as after World War I will be avoided. In other words, the cushioning effect of the current soft market might be a blessing in disguise to the scrap trade.

•

CHICAGO—The return to the market of a principal mill consumer has established definitely lower prices on open hearth grades. Some items were substantially under previously quoted transactions. This purchase on Monday of this week has established a definite market for open hearth grades although blast furnace material and electric furnace grades remain nominal in the strictest sense of the word. On one important part of the current purchase was a disclosure that railroad heavy melting steel was bought at $18.75 a ton, adding further indications to a weaker market. Although sales have not taken place in the district, offers to sell substantial tonnages by reputable brokers of bundled machine shop turnings at $16.75, cast iron borings and mixed borings and short turnings at $11.25 and electric furnace scrap at $2.50 off previous sales are responsible for revised quotations on these items. With removal of some grades of railroad scrap from allocation particular weakness is noted in the quoted price of cut bolsters and side frames, and weakness in angles and splice bars, No. 3 steel wheels, and couplers and knucklers. Cast scrap prices quoted represent the range between shipping point price of scrap of local origin plus minimum and brokerage, and the maximum freight which local foundries are willing to pay. Malleable prices quoted are nominal but weak.

•

DETROIT—Scrap prices sagged heavily here again with no firm buying offers. The few purchases made by mills—none in Detroit area—were evidently all on an exploratory basis, and dealers had little hope that quotations would be able to rise in the near future. The market for turnings has all but evaporated. Prices on low phos plate continued in the same range, but gave indication of possible softening.

•

PHILADELPHIA — Only one mill, Bethlehem, is doing any extensive purchasing here and has informed its suppliers that it expects to establish pre-OPA differentials with No. 1 heavy melting as the base price, No. 2 a dollar under, No. 2 bundles $2 under, and No. 3 bundles $4 under. As yet, no sales have been made, but it is understood that all mills will try to go back to the differential system. At present, heavy melting grades are selling at $2.50 below ceiling. Prices that railroad scrap will go for are still problematic and there is some talk of a disappearance of the differential between railroad and dealers' scrap. Cast grades are still strong with buyers asking for faster delivery.

•

BUFFALO — Sales of open hearth scrap have been made here in the last few days to an unnamed consumer at $18.25 a ton, or $1 under the OPA ceiling. Only small tonnages were involved. Meanwhile Bethlehem, Wickwire and Republic are withdrawn from the market, reporting no new commitments since the first of the month. These mills, reporting some old contracts still outstanding and adequate stocks on the ground for upwards of two months' operations, are unwilling to buy at or near ceilings in the present unsettled market. On the other hand, dealers generally report their yards are well cleared and are resisting efforts to depress prices. As a result business is virtually at a standstill. Another week to ten days is expected to bring a real test of the price structure. Cast iron is in better supply owing to a tendency in some quarters to scrap obsolescent machinery for tax purposes. Demand from foundries continues to exceed offerings and prices are firm. Blast furnace items show an easy undertone, with six of the district's 14 active stacks on merchant iron against five of 15 a short time ago. Two cargoes of open hearth scrap, aggregating 10,000 tons, are booked for shipment here from the Upper Lakes in the latter half of the month.

•

NEW YORK—Very little new business is being conducted in this area. Pittsburgh mills are completely out of the market. The Pennsylvania Railroad is attempting to market 6000 tons of No. 1 railroad scrap as the mills will no longer accept allocations. All open hearth grades are being bought in New York as low as $13.25. An attempt is being made to buy compressed galvanized bundles as low as $9.25, although the market is stabilized for the time being at $11.25.

•

BOSTON—Open quotations on turnings are 50c. to $1 a ton lower than heretofore. Bethlehem Steel Co. has withdrawn its $13.73 a ton bid on heavy steel. Sizable tonnages of unprepared steel have been sold, including 2300 tons at $6.10 a ton, and 700 tons at $5.13. Bids on 2800 tons at Braintree, Mass., material shipped on Bethlehem Steel Co. account, have been taken but not made public. Prices on foundry material hold at ceilings. Demand is good, but supply has tightened.

•

CINCINNATI—The market tends to be dull with mills virtually out of the market except for limited purchases at a price. Dealers generally are shying away from offerings unless immediate sale is possible. Speculation, of course, continues to be virtually absent from the market. Cupola scrap continues to be a tight item since the supply is limited. Prices on most mill items are soft, although the cast grades continue to be at or close to current ceilings.

•

BIRMINGHAM—There is no activity of any kind in this market at present. Inventories are still plentiful and there are no indications that consumers will be in the market here during the month of September.

Eliminate Bar Specifications

Washington

• • • **National emergency specifications for hot rolled flat carbon steel bars have been eliminated by an amendment to schedule 15 to L 211 WPB announced on Tuesday.**

Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages (for ceiling prices see O. P. A. schedule No. 4).

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.00 to	$18.50
RR hvy. melting steel	19.50 to	20.00
No. 2 hvy. melting	18.00 to	18.50
Railroad scrap rails	21.00 to	21.50
Rails, 3 ft. and under	....	23.50
Compressed sheet stl.	18.00 to	18.50
Hand bundled new sheets	18.00 to	18.50
Hvy. axle turnings	....	19.50
Hvy. forge turnings	....	19.50
Machine shop turn'gs	11.50 to	12.00
Shovel. turnings, alloy free	15.50 to	16.00
Mixed bor. & turn.	11.50 to	12.00
Cast iron borings	15.00 to	15.50
Hvy. breakable cast.	18.00 to	18.50
No. 1 cupola cast	22.00 to	23.00
RR knuckles and couplings	23.50 to	24.00
RR coil springs	24.00 to	24.50
RR leaf springs	23.50 to	24.00
RR rolled steel whls.	23.50 to	24.00
Low phos. billet crops	....	25.00
Low phos. punchings	....	22.50
Railroad malleable	....	22.00

CHICAGO

Per gross ton delivered to consumer

No. 1 hvy. melting	....	$18.75
No. 2 hvy. melting	....	18.75
No. 1 bundles	....	17.75
Bndld. mach. shop turnings	....	16.75
Galv. bundles (No. 3)	....	14.75
Mach. shop turnings	10.00 to	10.50
Short shoveling trngs.	....	12.25
Cast iron borings	....	11.25
Mix bor. & short turn.	....	11.25
Low phos. hvy. forge	....	21.25
Low phos. plates	....	18.75
No. 1 RR hvy. mltng.	....	19.75
No. 2 RR hvy. mltng.	....	17.75
Flues, tubes & pipes.	....	16.25
Reroll rails	....	15.25
Cut rails, 3 ft. and under	....	22.25
Locomotive tires, cut.	....	24.25
Cut bolsters & side frames	....	21.25
Angle & splice bars	....	21.25
No. 3 steel wheels	....	22.25
Couplers & knuckles.	....	22.25
Cut rails, 2 ft. and under	....	23.50
Miscellaneous rails	....	20.25
St'dard stl. car axles	....	25.75
No. 1 mach. cast	21.34 to	23.00
No. 1 agricul. cast	21.34 to	23.00
Cast iron car wheels	21.34 to	23.00
Hvy. breakable cast.	17.84 to	19.50
RR grate bars	16.59 to	18.25
Brake shoes	16.59 to	17.09
Stove plate	20.34 to	20.84
Clean auto cast	21.34 to	23.00
Agricul. malleable	23.34 to	25.00
RR malleaable	23.34 to	25.00

DETROIT

Per gross ton, brokers' buying prices:

No. 1 hvy. melting	$13.00 to	$13.50
No. 1 hyd. comp. sh'ts	13.00 to	13.50
No. 2 hvy. melting	13.00 to	13.50
No. 1 bundles	13.00 to	13.50
New busheling	13.00 to	13.50
Mach. shop turnings.	7.25 to	8.00
Short shov. turnings.	9.50 to	10.50
Cast iron borings	8.50 to	9.50
Mixed bor. & turns.	7.50 to	8.00
No. 1 cupola cast	....	20.00
Charging box cast	....	19.00
Hvy. breakable cast.	14.00 to	14.50
Stove plate	....	19.00
Flashings	13.00 to	13.50
Low phos. plate	16.50 to	17.00
Automotive cast	....	20.00

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.00 to	$18.50
No. 2 hvy. melting	18.00 to	18.50
Compressed sheet stl.	18.00 to	18.50
Drop forge flashings	18.00 to	19.00
Mach. shop turnings	11.00 to	11.50
Short shovel. trngs.	14.00 to	15.00
No. 1 busheling	18.00 to	19.00
Steel axle turnings	17.50 to	18.50
Low phos. billet and bloom crops	23.50 to	24.00
Cast iron borings	14.00 to	15.00
Mixed bor. & turns.	11.50 to	12.00
No. 2 busheling	15.50 to	16.50
No. 1 machine cast	....	20.00
Railroad cast	....	20.00
Railroad grate bars	....	15.25
Stove plate	....	19.00
Rails 3 ft. & under	....	23.00
Rails 18 in. & under	....	24.25
Rails for rerolling	....	23.00
Railroad malleable	....	22.00
Elec. furnace punchings	19.50 to	20.50

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	$16.75 to	$17.25
No. 2 hvy. melting	16.75 to	17.25
No. 1 bundles	16.75 to	17.25
Mach. shop turnings	12.50 to	13.00
Shoveling turnings	14.50 to	15.00
Cast iron borings	13.50 to	14.00
Mixed bor. & turns.	12.50 to	13.00
No. 1 cupola cast	....	20.00
Hvy. breakable cast.	....	16.50
Hvy. axle turnings	17.25 to	17.75
Hvy. forge turnings.	17.25 to	17.75
Low phos. plate punch	19.75 to	20.25
Billet crops	....	22.00

ST. LOUIS

Per gross ton delivered to consumer:

Hvy. melting	....	$17.50
No. 1 locomotive tires	....	18.00
Misc. stand. sec. rails	....	19.00
Railroad springs	....	19.00
Bundled sheets	....	15.00
Heavy turnings	....	12.25
Rerolling rails	....	21.00
Steel car axles	....	23.50
Steel rails under 3 ft.	....	21.50
Steel angle bars	....	21.00
Cast iron car wheels	....	20.00
No. 1 machinery cast	....	20.00
Railroad malleable	....	22.00
Breakable cast	....	16.50
Stove plate	....	19.00
Grate bars	....	15.25
Brake shoes	....	15.25

Note: Cast grades f.o.b. Shipping Point.

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting	$15.00 to	$15.50
No. 2 hvy. melting	15.00 to	15.50
No. 2 bundles	14.00 to	14.50
No. 1 busheling	12.00 to	12.50
Scrap rails	15.00 to	15.50
Rails 3 ft. & under	18.00 to	18.50
Angle & splice bars	17.00 to	17.50
Cast iron borings	7.00 to	7.50
Steel axles	15.00 to	15.50
Stove plate	17.00 to	17.50
Bar Crops and plate	17.00 to	17.50
Structural and plate	17.00 to	17.50
No. 1 cast	20.00 to	21.00
Cast iron carwheels	13.00 to	13.50

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.00 to	$18.50
No. 2 hvy. melting	18.00 to	18.50
Low phos plate	20.00 to	21.00
No. 1 busheling	18.00 to	18.50
Hydraulic bundles	18.00 to	18.50
Mach. shop turnings	11.50 to	12.00
Short shovel. trngs.	16.00 to	16.50
Cast iron borings	15.00 to	15.50

NEW YORK

Dealers' buying prices, per gross ton, on cars:

No. 1 hvy. melting	$13.25 to	$13.75
No. 2 hvy. melting	13.25 to	13.75
Hvy. breakable cast	....	16.50
Charging box cast	....	19.00
No. 1 cupola cast	....	20.00
Stove plate	....	19.00
No. 1 busheling	13.25 to	13.75
Hyd. comp. black bundles	13.25 to	13.75
Hyd. comp. galv. bundles	11.25 to	11.75
Clean chem. cast bor.	....	14.33
Mach. shop turnings.	9.25 to	9.75
Mixed bor. & turns.	9.25 to	9.75
Clean auto cast	....	20.00
Unstrip. motor blks.	....	17.50
No. 1 cupola cast	....	20.00

CINCINNATI

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.50 to	$19.50
No. 2 hvy. melting	18.50 to	19.50
No. 1 bundles	18.50 to	19.50
No. 2 bundles	18.50 to	19.50
Mach. shop turnings.	13.00 to	14.00
Shoveling turnings	14.00 to	15.00
Cast iron borings	13.50 to	14.50
Mixed bor. & turns.	12.50 to	13.50
No. 1 cupola cast	....	21.00
Hvy. breakable cast.	....	16.50
Low phos. plate	21.00 to	22.00
Scrap rails	....	21.00
Stove plate	17.00 to	18.00

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.25 to	$19.25
No. 1 bundles	18.25 to	19.25
No. 2 bundles	18.25 to	19.25
No. 2 hvy. melting	18.25 to	19.25
Mach. shop turnings	13.00 to	14.25
Shoveling turnings	....	16.25
Cast iron borings	....	15.25
Mixed bor. & turns.	....	14.25
No. 1 cupola cast	20.80 to	22.50
Stove plate	19.80 to	21.50
Low phos. plate	....	21.75
Scrap rails	....	20.75
Rails 3 ft. & under	....	22.75
RR steel wheels	....	23.75
Cast iron car wheels	....	20.00
RR coil & leaf sprgs.	....	23.75
RR knuckles & coup.	....	23.75
RR malleable	....	22.00
No. 1 busheling	....	19.25

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars

No. 1 hvy. melting	$13.75 to	$14.00
Bundled skeleton	....	13.73
Turnings, shovellings	....	12.06
Turnings, regular	7.50 to	8.00
Mixed bor. & turns.	7.00 to	7.50
Delivered to fdry. per gr. ton		
Breakable cast	21.57 to	21.87
Stove plate	20.00 to	23.51
Machinery cast, truck	21.00 to	23.51

CALIFORNIA BASING POINTS

Per gross ton delivered to consumer:

No. 1 hvy. melting	$14.00 to	$15.58
RR hvy. melting	....	15.58
No. 2 hvy. melting	13.00 to	14.58
Mach. shop turnings.	3.50 to	6.00
No. 1 cupola cast	23.00 to	24.00

Per gross ton delivered to consumer: (San Francisco and Los Angeles)

No. 1 hvy. melting	$16.00 to	$16.75
RR hvy. melting	16.00 to	16.75
No. 2 hvy. melting	15.00 to	15.75
Mach. shop turnings.	4.50 to	7.00
No. 1 cupola cast	23.00 to	25.00
No. 2 bales	14.00 to	14.75
No. 3 bales	10.00 to	10.75
Electric furnace 1 ft. under	17.00 to	19.50

SEATTLE

No. 1 hvy. melting	....	$14.50
RR hvy. melting	....	14.50
No. 3 bundles	....	12.50
No. 1 cupola cast	22.00 to	24.00
Electric furnace, 1 ft., under	16.00 to	17.00

NON-FERROUS METALS

. . . News and Market Activities

Sharp Drop in Mines Production

• • • **Except for copper,** production of metals in Canada has shown sharp drops from peak wartime figures and from levels of recent months this year. The decline in lead production is outstanding, the June total having been less than 20,000,000 lb. compared to a peak of 47,500,000 lb. in May, 1942. The drop in nickel production is probably the most critical, since in recent prewar years Canadian production has represented between 85 and 90 per cent of total world production. In one month, from May to June, 1944, Canadian nickel production has dropped 15 per cent. June zinc production of 39,700,000 lb. compares with a peak of 54,000,000 lb. in March, 1943. Gold production is down to about $111 million dollars annually, as compared with the high of $205,800,000, in 1941.

While Canadian officials will make no statements as to the causes of the reductions in nickel, lead, zinc, gold and silver production, producers state that curtailment is due to labor shortages. Many mine workers are rated as farmers. In order to retain their status which exempts them from military service, they return to the farm in the summer. This accounts for the drastic seasonal drop. But the demands of the military services upon miners have been heavy, and replacements are said to be negligible.

Canadian Metal Production

Source: Dominion Dept. of Trade and Commerce

	June 1944	May 1944	June 1943	First six months of 1944	First six months of 1943
Copper, lb.	47,747,056	48,359,046	46,647,568	286,719,761	297,416,474
Gold, oz.	239,916	256,837	326,839	1,522,797	1,972,700
Lead, lb.	19,744,120	20,491,362	39,306,495	152,234,710	239,637,846
Nickel, lb.	20,373,599	24,023,396	25,734,494	138,773,912	150,442,741
Silver, oz.	1,160,245	1,029,674	1,379,834	7,265,326	9,515,059
Zinc, lb.	39,759,143	45,646,454	53,266,795	267,059,405	312,091,853

Copper

• • • **Buyers are said to be limiting** purchases of primary copper to immediate requirements in view of the possibility of imminent German collapse, and for the first time since the war began copper and copper base alloy scrap is somewhat easier. This trend that has developed only in the last few days and is not sufficiently advanced to affect market prices which are still held to OPA ceilings. Action on the question of the strategic minerals and metals reserve have not yet been announced by the Senate and House conference committee considering the war surpluses disposal bills. Although the feeling in the industry is general that government cannot fail to provide for the permanent stockpiling of certain strategic metals, this measure will have an upsetting influence until a decision is made by the conferees.

•

Mercury

• • • **The spot price for mercury** has increased to $105-$106 per flask at New York from a low of $103 not so long ago, and a low of $100 in quantity. This reflects the closing of more than 100 marginal mines since the withdrawal of the Metals Reserve Co. purchase program in February, and the heavy buying of 30 days ago.

Mine production of mercury during June and July fell below domestic consumption during those months by 400 and 300 flasks respectively. July production according to the Bureau of Mines was 2700 flasks, a drop of 300 from the previous month. It would not be surprising if August consumption were higher than July's, yet little spot and nearby is available. Offerings are lacking and round lots for September and October delivery are subject to price negotiation.

•

Zinc

• • • **Stocks of slab zinc** have been increasing since January, 1943. The American Zinc Institute reports a stock of 241,622 tons on hand as of the end of August. However, this figure does not include an additional 15,000 tons from ore imports from Rhodesia, Australia, and Mexico. Increasing supplies of zinc metal are accumulating despite reduced mine production. In July the Bureau of Mines reported a decrease of 2440 tons over the preceding month, a drop of 4 per cent.

SHELL CASINGS: *Soldiers unload truck loads of salvaged brass shell casings at a salvage dump near Nettuno, Italy. The shells were fired by the U. S. Fifth Army.*

Primary Metals

(Cents per lb. unless otherwise noted)

Aluminum, 99+%, del'd. (Min. 10,000 lb.)	15.00
Antimony, American, Laredo, Tex.	14.50
Beryllium copper, 3.75-4.25% Be; dollars per lb. contained Be	$17.00
Cadmium, del'd.	90.00
Cobalt, 97-99% (dollars per lb.)	$2.11
100 lb. or more	$1.50
Copper, electro. Conn. valley	12.00
Copper, electro. New York	11.75
Copper, lake	12.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.5%, dollars per troy oz.	$7.50
Iridium, dollars per troy oz.	$165.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9+%, carlots	20.50
Magnesium, 12-in. sticks, carlots	27.50
Mercury, dollars per 76-lb. flask, f.o.b. New York	$103 to $105.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.67

Remelted Metals

(Cents per lb. unless otherwise noted)

Aluminum, No. 12 Fdy. (No. 2)	12.00
Aluminum, deoxidizing	7.50 to 11.00
Brass Ingot	
88-5-5-5 (No. 115)	13.25
88-10-2 (No. 215)	16.75
88-10-10 (No. 305)	16.00
No. 1 Yellow (No. 405)	10.25

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.87	....	20.37
Copper, H.R.	....	17.37	....
Copper drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	....

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier: 2S and 3S, 21.2c.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price: 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals; ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 24c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NON-FERROUS SCRAP METAL QUOTATIONS

†(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)

Copper, Copper Base Alloys

OPA Group 1†

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2†

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (Phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25

OPA Group 3†

Yellow brass soft sheet clippings	8.625
Yellow rod brass turnings	8.375
Zincy bronze borings	8.00
Zincy bronze solids	8.00
Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]
Manganese bronze borings	5.50[2]

OPA Group 4†

Automobile radiators	7.00

OPA Group 5†

Refinery brass	4.75*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys†

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.875

Aluminum

Plant scrap, segregated

All S-type alloys (except 2S)	6.00
2s solids	7.50
High grade alloys (cast)	6.00
Low grade alloys	4.00
Borings and turnings	
High grade alloys	4.00
Low grade alloys	2.50

Plant scrap, mixed

All solids	4.00
Borings and turnings	2.25

Obsolete scrap

Pure cable	7.00
Old sheet and utensils	6.00
Old castings and forgings	5.00
Pistons, free of struts	4.50
Pistons, with struts	2.50
Old alloy sheet	4.00

Magnesium

Segregated plant scrap

Pure solids and all other solids, exempt	
Borings and turnings	3.00

Mixed, contaminated plant scrap

Grade 1 solids	6.00
Grade 1 borings and turnings	3.00
Grade 2 solids	3.00
Grade 2 borings and turnings	2.00

Zinc

New zinc clippings, trimmings	6.50
Engravers' lithographers plates	6.50
Old zinc scrap	5.25
Unsweated zinc dross	5.50
Die cast slab	5.00
New die cast scrap	4.95
Radiator grilles, old and new	4.00
Old die cast scrap	3.50

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead inc. cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25⅛
Electrolytic, full size	22⅞
cut to size	30⅛
Rolled, oval, straight, 15 in. and longer	23¼
Curved	24¼
Brass Cast, 82-20, elliptical, 15 in. and longer	23⅝
Zinc: Cast, 99.99, 16 in. and over	16¼
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	58

Chemicals

(Cents per lb., delivery from New York)

Copper cyanide, tech., 100-lb. bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00-13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz., lots	40.82-41.125
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	33.00
Zinc, sulphate, 89% crystals, bbls.	6.80

Comparison of Prices . . .

Advances Over Past Week in Heavy Type; Declines in *Italics*. [Prices Are F.O.B. Major Basing Points]

Flat Rolled Steel: (Cents Per Lb.)	Sept. 12, 1944	Sept. 5, 1944	Aug. 8, 1944	Sept. 14, 1943
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs, rerolling	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	Sept. 12, 1944	Sept. 5, 1944	Aug. 8, 1944	Sept. 14, 1943
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.84	$25.89
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	25.11	25.11	25.11	24.68
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	25.39
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	37.34	37.34	37.34	31.34
Ferromanganese‡	135.00	135.00	135.00	135.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)				
Heavy melt'g steel, P'gh.	*$18.25*	$19.75	$20.00	$20.00
Heavy melt'g steel, Phila.	*17.00*	18.00	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	14.75	14.75	17.85	17.85
Low phos. plate, Youngs'n	20.50	20.50	22.50	22.50
No. 1 cast, Pittsburgh	*22.50*	24.50	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Ch'go	22.17	20.00	20.00	20.00
Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$7.00	$7.00	$7.00	$6.50
Foundry coke, prompt	8.25	8.25	8.25	7.50
Non-Ferrous Metals: (Cents per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	14.50	14.50	14.50	14.50

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 189-197.

Composite Prices . . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
September 12, 1944	2.25513c. a Lb.	23.61 a Gross Ton	*$18.00* a Gross Ton
One week ago	2.25513c. a Lb.	23.61 a Gross Ton	$18.84 a Gross Ton
One month ago	2.25513c. a Lb.	23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.26190c. a Lb.	23.61 a Gross Ton	$19.17 a Gross Ton

	HIGH	LOW	HIGH	LOW	HIGH	LOW
1943	2.25513c.,	2.25513c.,	$23.61	$23.61	$19.17	$19.17
1942	2.26190c.,	2.26190c.,	23.61	23.61	19.17	19.17
1941	2.43078c.,	2.43078c.,	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.67, June 8
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

. . . Finished Iron and Steel Prices

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. Extras apply. Delivered prices do not reflect 3% tax on freight. (1) Mill run sheet, 10c. per lb. under base; primes 25c. above base. (2) Unassorted 8-lb. coating. (3) Widths up to 12-in. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25c. per 100 lb. to fabricators. (8) Also shafting. For quantities of 20,000 to 29,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (12) Boxed. (13) Portland and Seattle price, San Francisco 2.50c. (14) This base price for annealed, bright finish wires, commercial spring wire.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Provo, Utah	[10] Pacific Ports, Cars	DELIVERED TO Detroit	New York	Philadelphia
Hot Rolled Sheets	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢			2.65¢	2.20¢	2.34¢	2.27¢
Cold Rolled Sheets[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢			3.70¢	3.15¢	3.39¢	3.37¢
Galv. Sheets (24 gage)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢			4.05¢		3.74¢	3.67¢
Enameling Sheets (20 gage)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢			4.00¢	3.45¢	3.71¢	3.67¢
Long Ternes[2]	3.80¢	3.80¢	3.80¢										4.55¢		4.16¢	4.12¢
Hot Rolled Strip[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢			2.75¢	2.20¢	2.46¢	
Cold Rolled Strip[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)						2.90¢	3.16¢	
Cooperage Stock Strip	2.20¢	2.20¢			2.20¢		2.20¢								2.56¢	
Commodity C-R Strip	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester = 3.35¢)						3.05¢	3.31¢	
Coke Tin Plate, Base Box	$5.00	$5.00	$5.00						$5.10						5.36¢	5.32¢
.50 Electro Tin Plate, Box	$4.50	$4.50	$4.50						$4.60							
.75 Electro Tin Plate, Box	$4.65		$4.65						$4.75							
Black Plate (29 gage)[5]	3.05¢	3.05¢	3.05¢						3.15¢				4.05¢[12]			3.37¢
Mfg. Ternes, Special Box	$4.30	$4.30	$4.30						$4.40							
Carbon Steel Bars	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢		2.80¢	2.25¢	2.49¢	2.47¢
Rail Steel Bars[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢		2.80¢			
Reinforcing (Billet) Bars[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢		2.55¢[13]	2.25¢	2.39¢	
Reinforcing (Rail) Bars[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢		c2.55¢[13]	2.25¢		2.47¢
Cold Finished Bars[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢		(Detroit = 2.70¢)				(Toledo = 2.80¢)			2.99¢	2.97¢
Alloy Bars, Hot Rolled	2.70¢	2.70¢				2.70¢	(Bethlehem, Massillon, Canton = 2.70¢)							2.80¢		
Alloy Bars, Cold Drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢								3.45¢		
Carbon Steel Plates	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	(Coatesville and Claymont = 2.10¢) 2.10¢	2.35¢		2.45¢	2.60¢	2.65¢	2.32¢	2.29¢	2.15¢
Floor Plates	3.35¢	3.35¢									3.70¢		4.00¢		3.71¢	3.67¢
Alloy Plates	3.50¢	3.50¢			(Coatesville = 3.50¢)						3.95¢		4.15¢		3.70¢	3.59¢
Structural Shapes	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem = 2.10¢)			2.45¢		2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R 0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)									
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)									
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)									
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)									
Bright Wire[14]	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)		(Duluth = 2.65¢)				3.10¢			2.92¢
Galvanized Wire	Add proper size extra and galvanizing extra to Bright Wire base															
Spring (High Carbon)	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)						3.70¢			3.52¢
Steel Sheet Piling	2.40¢	2.40¢				2.40¢							2.95¢			2.72¢

EXCEPTIONS TO PRICE SCHED. NO. 6

Slabs—Andrews Steel Co. $41 basing pts.; Wheeling Steel Corp. $34 Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. $41; Phoenix Iron Co. (rerolling) $41, (forging) $47; Granite City Steel $47.50.

Blooms—Phoenix Iron Co. (rerolling) $41, (forging) $47; Pgh. Steel Co. (reroll) $38.25, (forging) $44.25.

Sheet Bar—Empire Sheet & Tin Plate Co. $39 mill; Wheeling Steel Corp. $38 Portsmouth, Ohio.

Billets, Forging—Andrews Steel Co. $50 basing pts.; Follansbee Steel Corp. $49.50 Toronto; Phoenix Iron Co. $47.00 mill. Geneva Steel Co. $64.64 f.o.b. Pacific Coast; Pittsburgh Steel Co. $49.50.

Billets, Rerolling—Continental Steel Corp. may charge Acme Steel in Chicago switching area $34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) $41 mill; Wheeling Steel Corp. (small) $36 Portsmouth, Ohio; (blooming mill sizes) applicable base, f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at $39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. $41 mill; Continental Steel Corp. (1¾ x 1¾) $39.50, (2 x 2) $40.60 Kokomo, Ind. (these prices include $1 size extra); Keystone Steel & Wire Co. $36.40 Peoria; Connors Steel Co. $50.69 Birmingham; Ford Motor Co. $34 Dearborn, Mich. Geneva Steel Co. $58.64 f.o.b. Pac. C. Pgh. Steel Co. $43.50.

Structural Shapes—Phoenix Iron Co. $2.35 basing pts. (export) $2.50 Phoenixville; Knoxville Iron Co. $2.30 basing points.

Bar Size Shapes—(Angles) W. Ames & Co., 10 tons or over, $3.10 mill.

Rails—Sweet Steel Co. (rail steel) $50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron Corp., $45 Pueblo.

Hot Rolled Plate—Granite City Steel Co. $2.65 mill; Knoxville Iron Co. $2.25 basing pts.; Kaiser Co. and Geneva Steel Co. $3.20 Pacific Ports; Central Iron & Steel Co. $2.50 basing points; Granite City Steel Co. $2.35 Granite City.

Merchant Bars—W. Ames Co., 10 tons and over, $2.85 mill; Eckels-Nye Steel Corp., $2.50 basing pts. (rail steel) $2.40; Phoenix Iron Co. $2.40 basing pts.; Sweet Steel Co. (rail steel) $2.35 mill; Joslyn Mfg. & Supply Co., $2.35 Chicago; Calumet Steel Div., Borg Warner Corp. (8 in. mill bars) $2.35 Chicago; Knoxville Iron Co. $2.30 basing pts. Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.o.b. Madison, Ill. Milton Mfg. Co. $2.75 f.o.b. Milton, Pa.

Logan Iron and Steel Co., Burnham, Pa., wrought iron bars, Grade I, $7.90 per 100 lb. f.o.b. plant. Ceiling is $7.40 per 100 lb.

Reinforcing Bars—W. Ames & Co., 10 tons and over, $2.85 mill; Sweet Steel Co. (rail steel) $2.35 mill; Columbia Steel Co. $2.50 Pacific Ports.

Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to Massfield, Mass., f.o.b. Massfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight Buffalo to Readville, Mass. f.o.b. Readville; Medart Co. in certain areas, Chicago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.

Alloy Bars—Texas Steel Co. for delivery except Texas and Okla. Chicago, base, f.o.b. Fort Worth, Tex.; Connors Steel Co. shipped outside Ala., Mississippi, Louisiana, Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.

Hot Rolled Strip—Joslyn Mfg. & Supply Co. $2.30 Chicago; Knoxville Iron Co. $2.25 basing pts.

Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel Co., $2.25 Parkersburg.

Galvanized Sheets—Andrews Steel Co., $3.75 basing pts.; Parkersburg Iron & Steel Co. $3.85 Parkersburg; Apollo Steel Co. $3.75 basing pts.; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.

Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.

Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is $2.45 per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-45 Ann.
**Philadelphia	3.518	4.87[6]	5.018a	3.922	4.772	3.605	3.666	3.822	4.072	5.966	7.066	7.272	8.322
New York	3.590	4.61[3]	5.010	3.974[6]	4.772	3.768	3.758	3.853	4.103	6.008	7.108	7.303	8.353
Boston	3.744	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.262	7.344	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.052	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.165	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.65[17]	3.55	3.55	3.50	3 75	5.75	6.85	6.85	7.90
Milwaukee	3.387	4.33[7]	5.272[4]	3.737	4.78[17]	3.687	3.687	3.637	3 887	5.987	7.087	7.087	8 137
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.588	3.35	3.75	5.958	7.058	6.85	7.90
Buffalo	3.35	4.40	4.75[4]	3.819	4.689	3.63	3.40	3.35	3.75	5.75	6.85	6.85	7.90
Detroit	3.45	4.50	5.00[4]	3.70	4.65[17]	3.609	3.661	3.45	3.80	6.08	7.18	7.159	8.209
Cincinnati	3.425	4.47[5]	4.825[5]	3.675	4.711	3.611	3.691	3.611	4.011	....	....	....	....
St. Louis	3.397	4.34[7]	5.172[4]	3.747	4.93[17]	3.697	3.697	3.647	4.031	6.131	7.231	7.231	8.281
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	6.85	6.85	7.90
St. Paul	3.51	4.48	5.257[4]	3.86	4.35[17]	3.81[13]	3.81[13]	3.76[13]	4.361	6.09	7.19	7.561	8.711
Omaha	3.665	5.443	5.608[4]	4.215	....	4.165	4.165	4.115	4.43	....	....	....	....
Indianapolis	3.58	3.58	4.568	4.918	3.768	4.78	3.63	3.58	3.98	8.08	7.18	7.18	8.23
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.43	....	....	....	....
Memphis	3.965[7]	4.66	3.265	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.058*	4.95	5.358	4.308	....	4.158	4.158*	4.108*	4.629	....	....	....	....
Houston	3.763	5.573	6.313[1]	4.313	....	4.25	4.25	3.75	6.373[3]	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.20[3]	6.10[4]	4.95	5.61[15]	4.95	4.65	4.40	5.583	8.304	9.404	9.404	10.454
San Francisco	4.55[14]	7.30[4]	6.35[4]	4.50[14]	7.33[17]	4.65[14]	4.35[14]	4.15[14]	5.333	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.05[4]	5.95[4]	4.25[12]	....	4.75[12]	4.45[12]	4.35[12]	5.783	....	9.404	....	....
Portland	4.65[11]	6.60[4]	5.75[4]	4.75[11]	....	4.75[11]	4.45[11]	4.45[11]	5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.53[17]	....	6.17[18]	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	5.90	....	....	....	....[4]

MILL EXTRAS FOR NATIONAL EMERGENCY STEELS

Designation	Basic Open-Hearth		Electric Furnace	
	Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs
NE 1330	0.10¢	$2.00	....	.....
NE 1335	0.10	2.00	....	.....
NE 1340	0.10	2.00	....	.....
NE 1345	0.10	2.00	....	.....
NE 1350	0.10	2.00	....	.....
NE 8612	0.65¢	$13.00	$1.15	$23.00
NE 8615	0.65	13.00	1.15	23.00
NE 8617	0.65	13.00	1.15	23.00
NE 8620	0.65	13.00	1.15	23.00
NE 8622	0.65	13.00	1.15	23.00
NE 8625	0.65	13.00	1.15	23.00
NE 8627	0.65	13.00	1.15	23.00
NE 8630	0.65	13.00	1.15	23.00
NE 8632	0.65	13.00	1.15	23.00
NE 8635	0.65	13.00	1.15	23.00
NE 8637	0.65	13.00	1.15	23.00
NE 8640	0.65	13.00	1.15	23.00
NE 8642	0.65	13.00	1.15	23.00
NE 8645	0.65	13.00	1.15	23.00
NE 8647	0.65	13.00	1.15	23.00
NE 8650	0.65	13.00	1.15	23.00
NE 8712	0.70¢	$14.00	$1.20	$24.00
NE 8715	0.70	14.00	1.20	24.00
NE 8717	0.70	14.00	1.20	24.00
NE 8720	0.70	14.00	1.20	24.00
NE 8722	0.70	14.00	1.20	24.00
NE 8725	0.70	14.00	1.20	24.00
NE 8727	0.70	14.00	1.20	24.00
NE 8730	0.70	14.00	1.20	24.00
NE 8732	0.70	14.00	1.20	24.00
NE 8735	0.70	14.00	1.20	24.00
NE 8737	0.70	14.00	1.20	24.00
NE 8740	0.70	14.00	1.20	24.00
NE 8742	0.70	14.00	1.20	24.00
NE 8745	0.70	14.00	1.20	24.00
NE 8747	0.70	14.00	1.20	24.00
NE 8750	0.70	14.00	1.20	24.00
NE 9255	0.40¢	$8.00	....	.....
NE 9260	0.40	8.00	....	.....
NE 9261	0.65	13.00	....	.....
NE 9262	0.65	13.00	....	.....
NE 9415	0.75¢	$15.00	$1.25	$25.00
NE 9417	0.75	15.00	1.25	25.00
NE 9420	0.75	15.00	1.25	25.00
NE 9422	0.75	15.00	1.25	25.00
NE 9425	0.75	15.00	1.25	25.00
NE 9427	0.75	15.00	1.25	25.00
NE 9430	0.75	15.00	1.25	25.00
NE 9432	0.75	15.00	1.25	25.00
NE 9435	0.75	15.00	1.25	25.00
NE 9437	0.75	15.00	1.25	25.00
NE 9440	0.75	15.00	1.25	25.00
NE 9442	0.80	16.00	1.30	26.00
NE 9445	0.80	16.00	1.30	26.00
NE 9447	0.80	16.00	1.30	26.00
NE 9450	0.80	16.00	1.30	26.00
NE 9722	0.65¢	$13.00	$1.15	$23.00
NE 9727	0.65	13.00	1.15	23.00
NE 9732	0.65	13.00	1.15	23.00
NE 9737	0.65	13.00	1.15	23.00
NE 9742	0.65	13.00	1.15	23.00
NE 9745	0.65	13.00	1.15	23.00
NE 9747	0.65	13.00	1.15	23.00
NE 9750	0.65	13.00	1.15	23.00
NE 9763	0.65	13.00	1.15	23.00
NE 9768	0.65	13.00	1.15	23.00
NE 9830	$1.30	$26.00	$1.80	$36.00
NE 9832	1.30	26.00	1.80	36.00
NE 9935	1.30	26.00	1.80	36.00
NE 9837	1.30	26.00	1.80	36.00
NE 9840	1.30	26.00	1.80	36.00
NE 9842	1.30	26.00	1.80	36.00
NE 9845	1.30	26.00	1.80	36.00
NE 9847	1.30	26.00	1.80	36.00
NE 9850	1.30	26.00	1.80	36.00
NE 9912	$1.20	$24.00	$1.55	$31.00
NE 9915	1.20	24.00	1.55	31.00
NE 9917	1.20	24.00	1.55	31.00
NE 9920	1.20	24.00	1.55	31.00
NE 9922	1.20	24.00	1.55	31.00
NE 9925	1.20	24.00	1.55	31.00
NE 52100A	....	.....	$2.60	$52.00
NE 52100B	....	.....	2.60	52.00
NE 52100C	....	.....	2.60	52.00

Note 1: The ranges shown are restricted to sizes 100 sq. in. or less or equivalent cross-sectional area 18 in. wide or under, with a maximum individual piece weight of 7000 lb. irrespective of size. **Note 2:** For steels ordered to such ranges, below the size and weight restriction, the average of all the chemical checks must be within the limits specified subject to check analysis variations given in Table 4, Section 10, A.I.S.I. Steel Products Manual. **Note 3:** When acid open-hearth is specified and acceptable, add to basic open-hearth alloy differential 0.25c. per lb. for bars and bar strip and $5 per gross ton for billets, blooms and slabs. **Note 4:** The extras shown are in addition to the base price of $2.70 for 100 lb. on finished products and $54 per gross ton on semi-finished steel, major basing points, and are in cents per pound when applicabale to bars and bar-strip, and in dollars per gross ton when applicable to billets, blooms and slabs. The full extra applicable over the base price is the total of all extras indicated by the specific requirements of the order. The higher extra shall be charged for any size falling between two published extras.

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 1999 lb. (7) 400 to 1999 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

(*) Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271c. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports**)

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

PRICES

SEMI-FINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill.... $31.00
Exceptions: Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast Ports; Empire Sheet & Tinplate Co., $34.25. Pgh. Steel Co. $33.10.

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00
Exceptions: Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports. Pgh. Steel Co. $38.10.

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh $45.00
Exceptions: C/L delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12 higher. Provo, $11.20 higher. Delivered prices do not reflect three per cent tax on freight rates.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton 54.00
Price delivered Detroit $2.00 higher; E. Michigan $3.00 higher.

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52 00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.
Prices delivered Detroit are $2.00 higher; E Michigan, $3 higher.
Price Exception: Follansbee Steel Corp. permitted to sell at $13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of $52.00.
Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher.

"HERCULES" RED-STRAND WIRE ROPE

You Can Depend On "Hercules" (Red Strand) Wire Rope

Highlights of Quality

1. Acid Open-Hearth Steel Wire
2. Rigid Tests and Inspections
3. Correct Manufacturing Methods
4. Furnished in both the Round and Flattened Strand constructions, in either Standard or Preformed Type.

• • *Results are what count, and the performance record of this wire rope continues to make and hold friends.*

There is no guess work when you use "HERCULES" (Red-Strand) Wire Rope. It is designed and built to do specific jobs better . . . safer . . . more economically. If you will tell us how you use wire rope, we shall be glad to suggest the construction and type most suitable for your conditions.

MADE ONLY BY
A. LESCHEN & SONS ROPE CO.
WIRE ROPE MAKERS — ESTABLISHED 1857
5909 KENNERLY AVENUE — ST. LOUIS, MISSOURI, U. S. A.

NEW YORK • • • 90 West Street
CHICAGO • • 810 W. Washington Blvd.
DENVER • • • 1554 Wazee Street
SAN FRANCISCO • • 320 Fourth Street
PORTLAND • • 914 N. W. 14th Avenue
SEATTLE • • 3410 First Avenue South

MACHINED BRONZE BEARINGS
GRAPHITED AND OILLESS BRONZE BEARINGS
BRONZE GEAR BLANKS
MACHINED BRONZE PARTS

S & H Bronze Bearings are made of cast bronze, under the most modern conditions and of specifications to meet the most exacting requirements. We are manufacturers of plain bronze and graphited and oilless bronze bearings for all branches of the Government Services, as well as plain cylinder type, single and double flange, thrust washers, from ⅜" in diameter to 20" in diameter. We also manufacture special parts made of cast bronze. Our manufacturing methods and equipment enable us to meet the most exacting machining specifications.

If it's Bronze — BETTER B BEARINGS — *We make it*

INDUSTRIAL BEARINGS

S. & H. Bearing and Manufacturing Co.
340-344 North Avenue, East
Cranford New Jersey

ERIE BUCKETS

General Purpose
Dredging and Hard Digging
Dragline
Material Handlers
Hook-on Type
Ore Handling
Coal and Coke
4-Rope
Barge Type
Strayer Electric

THE COMPLETE LINE

Write for Data

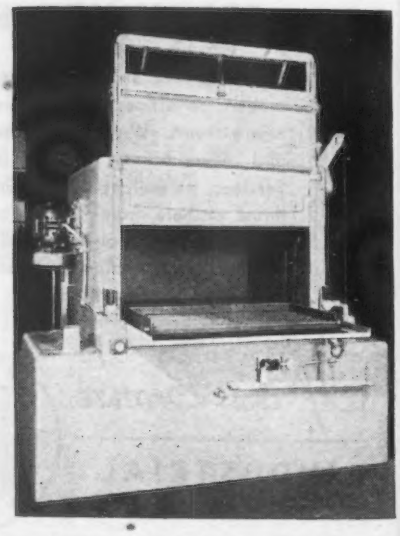
Above types built in weights and capacities to suit your crane and job requirements.

ERIE STEEL CONSTRUCTION CO.
ERIE, PENNSYLVANIA
Aggre Meters • Buckets • Concrete Plants • Traveling Cranes

Ransohoff

EQUIPMENT FOR THE SURFACE TREATMENT OF METALS

RANSOHOFF CABINET TYPE WASHER
With Built-In Walking Spray



THE last word in practical application of a "walking spray" which moves back and forth across the work, reaching every bit of it. This cuts down the number of spray holes and permits the use of low gallonage pumps which reduces initial and operating costs.

The RANSOHOFF WASHER may be equipped for wash only or for wash and rinse and if desired, a hot air blower may be added for drying. For small parts up to large assemblies.

Illustrated: cleaning rear axle housings. Work is placed on moveable tray, pushed into cabinet and door closed. Wash pump is started and the "walking spray" moves back and forth insuring complete cleaning of work.

Write for details . . . let the RANSOHOFF ENGINEERS help you.

automatic, economical washing, rinsing, drying, pickling, burnishing, descaling, de-burring, rustproofing, surface treatment for paint base

N. RANSOHOFF, Inc. 1315 Township Ave. CINCINNATI, O.

PRICES

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills
(F.o.b. Pittsburgh only on wrought pipe)
Base Price—$200.00 per Net Ton

	Black	Galv.
Steel (Butt Weld)		
⅛ in.	63½	51
¼ in.	66½	55
⅜ to 3 in.	68½	57½
Wrought Iron (Butt Weld)		
⅛ in.	24	3½
¼ in.	30	10
⅜ and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18
Steel (Lap Weld)		
2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½
Wrought Iron (Lap Weld)		
2 in.	30½	13
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
Steel (Butt, extra strong, plain ends)		
⅛ in.	61½	50½
¼ in.	65½	54½
⅜ to 3 in.	67	57
Wrought Iron (Same as Above)		
⅛ in.	25	6
¼ in.	31	12
⅜ to 2 in.	38	19½
Steel (Lap, extra strong, plain ends)		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
Wrought Iron (Same as Above)		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle.	71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless Cold Drawn	*Seamless Hot Rolled*	*Lap Weld, Hot Rolled*
2 in. o.d. 13 B.W.G.	15.03	13.04	12.33
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.18
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft., and over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

PRICES

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	Pacific Coast Basing Points†
	Base per Keg	
Standard wire nails.....	$2.55	$3.05
Coated nails	2.55	3.05
Cut nails, carloads	3.85	....
	Base per 100 Lb.	
Annealed fence wire	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence*	$0.67	$0.85
Fence posts, carloads ...	.69	.86
Single loop bale ties ...	.59	.84
Galvanized barbed wire**	.70	.80
Twisted barbless wire ..	.70	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.
†Prices subject to switching or transportation charges.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:
Base discount less case lots

	Per Cent Off List
½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:
(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 in. to 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 per cent additional discount.

Stove Bolts — *Consumer*

Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets
(½ in. and larger)

	Base per 100 lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets
(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws — *Consumer Per Cent Off List*

Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE
(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

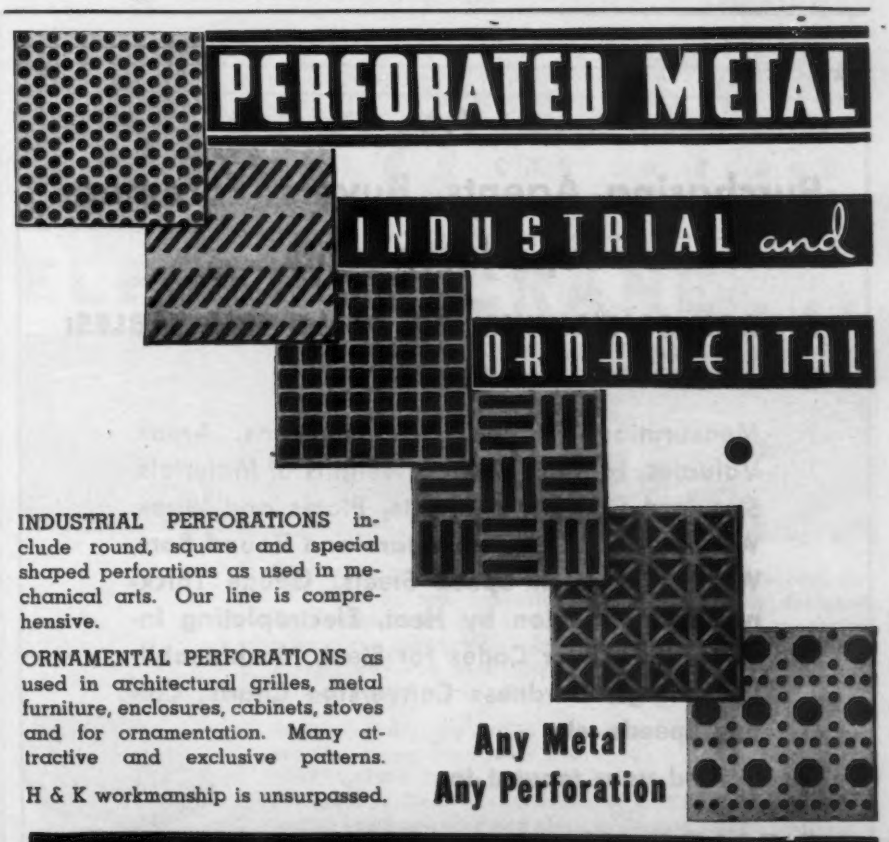
"Plus or Minus"....

Those "tolerance" boys with the devilish micrometers sometimes want springs made to tight measurements···we just smile···and make them···but it adds plenty of "plus" to the cost. Lots of springs aren't so fussy···just good quality and easy tolerances···we make them, too···for less. We'll tackle your jobs-either kind-and try to give satisfaction because we want to be

"Everybody's Spring Dept."

DUNBAR
BROTHERS CO.
DIV. OF ASSOCIATED SPRING CORP.
BRISTOL, CONN.

SPRINGS · WIRE FORMS · SMALL STAMPINGS



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PIG IRON

All prices set in bold face type are maxima established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maxima. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorus	Charcoal
Boston	*$25.50*	*$25.00*	*$26.50*	*$26.00*	.....	.....
Brooklyn	*27.50*	*27.00*		*28.00*	.....	.....
Jersey City	*26.53*	*26.03*	*27.53*	*27.03*	.....	.....
Philadelphia (4)	*25.84*	*25.34*	*26.84*	*26.34*	*$30.74*	.....
Bethlehem, Pa.	25.00	24.50	26.00	25.50	.....	.....
Everett, Mass.	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.		24.50			29.50	.....
Birdsboro, Pa. (3)	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50			.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa. (1)	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.00	25.00	24.50	29.50	.....
Cincinnati, Ohio	*25.11*	*24.61*	.....	*25.11*	.....	.....
Canton, Ohio	*25.39*	*24.89*	*25.89*	*25.39*	*32.69*	.....
Mansfield, Ohio	*25.94*	*25.44*	*26.44*	*25.94*	*32.86*	.....
St. Louis	*24.50*	*24.50*	.....	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	*35.46*	.....*$37.34*
Granite City, Ill.	24.00	23.50	24.50	24.00		.....
Cleveland	24.00	23.50	24.50	24.00	*32.42*	.....
Hamilton, Ohio	24.00	23.50		24.00		.....
Toledo	24.00	23.50	24.50	24.00		.....
Youngstown	24.00	23.50	24.50	24.00	*32.42*	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc.	.....		.....	.....	.....	34.00
Lyles, Tenn. fc. (2)	.....		.....	.....	.....	33.00
St. Paul	*26.63*	*26.13*	*27.13*	*26.63*	*39.80*	.....
Duluth	24.50	24.00	25.00	24.50	.....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	*26.95*		.....	.....	.....	.....
San Francisco	*26.95*		.....	.....	.....	.....
Seattle	*26.95*		.....	.....	.....	.....
Provo, Utah	22.00	21.50	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	.....	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	.....	*26.00*	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace $23.50

(1) Pittsburgh Coke & Iron Co. (Sharpsville, Pa., furnace only) and the Struthers Iron and Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable. Struthers Iron and Steel Co. may add another $1.00 per gross ton for iron from Struthers, Ohio, plant.

(2) Price shown is for low-phosphorous iron; high phosphorous sells for $28.50 at the furnace.

(3) E. & G. Brooke Co. Birdsboro, Pa., permitted to charge $1.00 per ton extra.

(4) Pittsburgh Ferromanganese Co. (Chester furnace only) may charge $2.38 a ton over maximum basing point prices.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, c. per lb., ton lots.

Copper, electrolytic, 150 and 200 mesh .....21⅛ to 23⅛c.
Copper, reduced, 150 and 200 mesh .....20⅛ to 25⅛c.
Iron, commercial, 100 and 200 mesh, 96 + % Fe.....13⅛ to 15c.
Iron, crushed, 200 mesh and finer, 90 + % Fe, carload lots .....4c.
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots .....63c.
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe.30 to 33c.
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe .....42c.
Iron, carbonyl, 300 mesh and finer, 98-99.8 + % Fe .....90c.
Aluminum, 100 and 200 mesh.*23 to 27c.
Antimony, 100 mesh .....20.6c.
Cadmium, 100 mesh $1
Chromium, 150 mesh $1.03
Lead, 100, 200 & 300 mesh, 11⅛ to 12⅛c.
Manganese, 150 mesh .....51c.
Nickel, 150 mesh .....51½c.
Solder powder, 100 mesh, 8½c. plus metal
Tin, 100 mesh .....58¾c.
Tungsten metal powder, 98%-99%, any quantity, per lb. $2.60
Molybdenum powder, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb. $2.60
Under 100 lb. $3.00

*Freight allowed east of Mississippi.

COKE

Furnace, beehive (f.o.b. oven)	Net Ton
Connellsville, Pa.	$7.00*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	8.25
Foundry, By-Product	
Chicago, del'd	13.35
Chicago, f.o.b.	12.60
New England, del'd	14.25
Kearny, N. J., f.o.b.	12.65
Philadelphia, del'd	12.88
Buffalo, del'd	13.00
Portsmouth, Ohio, f.o.b.	11.10
Painesville, Ohio, f.o.b.	11.75
Erie, del'd	12.75
Cleveland, del'd	12.80
Cincinnati, del'd	12.85
St. Louis, del'd	13.85
Birmingham, del'd	10.50

*Hand drawn ovens using trucked coal permitted to charge $7.75 per ton plus transportation charges. **Mo., Ala., and Tenn. producers—$13.35.

★ ★

For

Purchasing Agents, Buyers, Foremen, Superintendents

A BOOK CONTAINING THE FOLLOWING TABLES:

(Size 5½ x 8½)

Mensuration, Trigonometric Functions, Areas, Volumes, Lengths of Arcs, Weights of Materials, Standard Gauges of Sheets, Plates and Wires, Weights and Areas of Square and Round Bars, Weights of High Speed Steels, Gauge Thicknesses, Expansion by Heat, Electroplating Information, Color Codes for Steel, Machineability Ratings, Hardness Conversion Charts, Cutting Speeds, etc.

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27 NORTH 4TH STREET, MINNEAPOLIS 1, MINN.

P. O. BOX 1124

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PRICES

REFRACTORIES
(F.o.b. Works)

Fire Clay Brick	*Per 1000*
Super-duty brick, St. Louis	$64.60
First quality, Pa., Md., Ky., Mo., Ill.	51.30
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	46.55
Second quality, New Jersey	51.00
No. 1, Ohio	43.00
Ground fire clay, net ton	7.60
Silica Brick	
Pennsylvania and Birmingham	$51.30
Chicago District	58.90
Silica cement, net ton (Eastern)	9.00
Chrome Brick	*Per Net Ton*
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00
Magnesite Brick	
Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00
Grain Magnesite	
Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.48
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

RAILS, TRACK SUPPLIES
(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	$40.00
Angle splice bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$40.00
Light rails (from rail steel)	39.00
	Base per Lb.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

CORROSION AND HEAT-RESISTING STEEL
(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

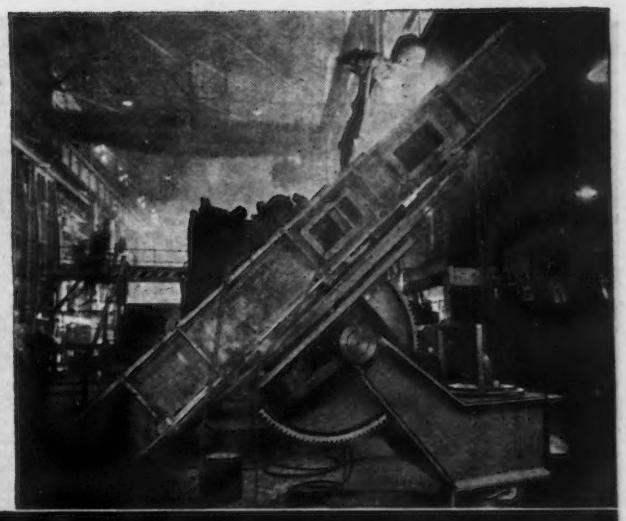
*Includes annealing and pickling.

ELECTRICAL SHEETS
(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

Handle the BIG JOBS *Easily and Safely*



C-F POSITIONERS

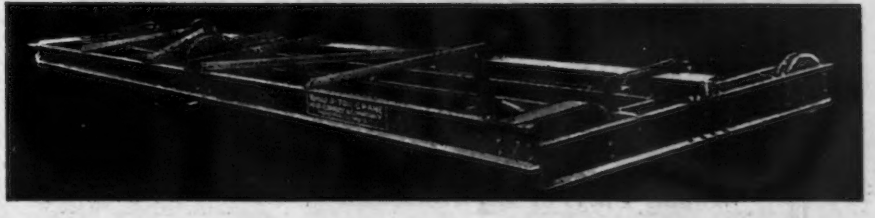
With C-F Positioners each welder can position even the most cumbersome weldments with a push button control —without crane work or handling crews. He can rotate the weldment a full 360°, rotate it at any speed from 0 R.P.M. up and can tilt it to 135° beyond horizontal . . . can weld all sides, surfaces and angles down-hand with a single set-up; with larger rods and fewer passes. All C-F Positioners, both stationary and portable, are pedestal mounted to give maximum floor and working clearance; all are adjustable for height.

Write for Bulletin WP-22

CULLEN-FRIESTEDT CO.

1303 S. Kilbourn Ave. Chicago 23, Ill.

CONCO *3-Motor Single Girder* CAB OR FLOOR OPERATED ELECTRIC CRANE . . .



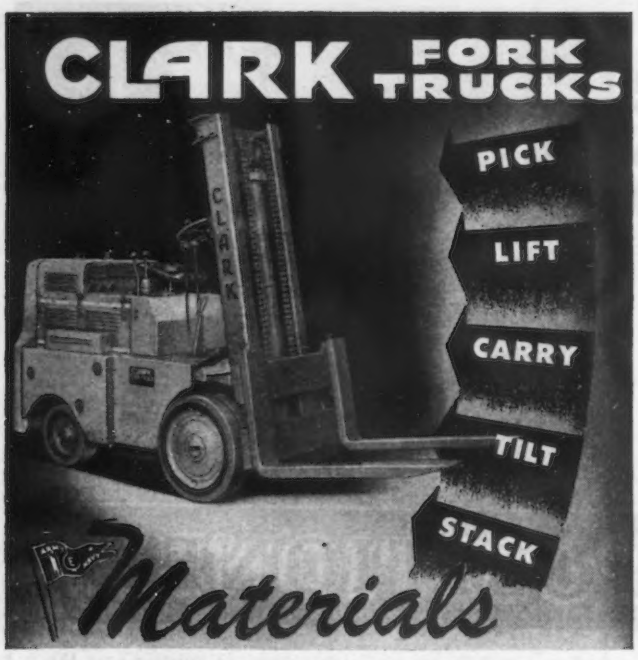
● Available in capacities of one through five tons for floor or cab operation. Simply, ruggedly designed for low first cost and maintenance. Used with Low Headroom Type Hoist, provides for maximum space coverage horizontally and vertically. Effective in even a minimum space. Write for Bulletin 2000.

Write for Bulletin 26000 describing the Torpedo Hoist shown. Three capacities 250 lb. — $139.50, 500 lb. — $149.50, 1000 lb. — $159.50. Heavily, simply built, with Push Button Control. Outstanding in CONCO'S complete line of hand-powered and electric Cranes, Hoists, Trolleys.

CONCO ENGINEERING WORKS

A div. of H. D. Conkey & Co. — 15 Grove St. — Mendota, Ill.

Builders Of Conco Torpedo Electric Hoist



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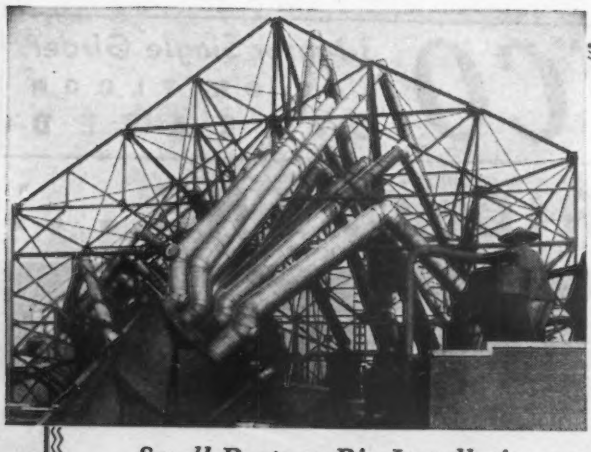
BATTLE CREEK, MICHIGAN, U.S.A.



SEPARATOR of Unique Dust Collecting System, exhausting into 11-ft. steel duct 250-ft. long for bagging off. Complete system, including 50-ton steel frame, designed, fabricated, installed by Brandt.

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BRANDT of Baltimore—*Craftsmen in Metal Since 1890*

PRICES

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Bethlehem, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Carload lots (packed)	141.00
Less ton lots (packed)	148.50

Premium, $1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.

96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk	36c.
L.c.l. lots	38c.

95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. Fe.

Carload, bulk	34c.
L.c.l. lots	35c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carlots, f.o.b. shipping point with freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
50% Si	6.65c.	7.10c.	7.25c.
75% Si	8.05c.	8.20c.	8.75c.
80-90% Si	8.90c.	9.05c.	9.55c.
90-95% Si	11.05c.	11.20c.	11.65c.

Spot sales add: .45c. per lb. for 50% Si, .3c. per lb. or 75% Si .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

(*C/L, Per Gross Ton, base* 6.00 to 6.50 *Si*)

F.o.b. Jackson, Ohio	$29.50*
Buffalo	30.75*

For each additional 0.50% silicon add $1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add $1 a ton for 0.75% phosphorous or over.

*OPA price established 6-24-41.

Bessemer Ferrosilicon

Prices are $1 a ton above silvery iron quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe.	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe.	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb.-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05c.
2000 lb. to carload	6.70c.
Under 2000 lb.	6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.
2000 lb. to carload	6.30c.
Less ton lots	6.55c.

Ferrochrome

(*65-72% Cr, 2% max. Si*)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10% C	13.00c.	13.40c.	14.00c.

PRICES

Other Ferroalloys

Ferrotungsten, Standard grade, lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten, 10,000 lb. or more... $1.90

Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.
- Open Hearth $2.70
- Crucible $2.80
- Primos $2.90

Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal..... $1.50

Vanadium pentoxide, 88%-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5..... $1.10

Ferroboron, contract basis, 17.50% min. Bo, f.o.b. producer's plant with usual freight allowances, per lb. of alloy.
- 2000 lb. to carload..... $1.20
- Under 2000 lb..... 1.30

Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)
- Carload lots ..... 25c.
- 2000 lb. to carload..... 26c.

Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)
- Carload lots ..... 58c.
- 2000 lb. to carload..... 59c.

Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis
- No. 1 ..... 87.5c.
- No. 6 ..... 60c.
- No. 79 ..... 45c.

Bortram, f.o.b. Niagara Falls
- Ton lots, per lb..... 45c.
- Less ton lots, per lb..... 50c.

Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.
- 2000 lb. lots $2.25
- Under 2000 lb. lots $2.30

Ferrotitanium, 40%-45%, f.o.b. 0.10c. max. Niagara Falls, N. Y., ton lots, per lb. contained Ti.. $1.23
- Less ton lots $1.25

Ferrotitanium, 20%-25%, 0.10 C max., ton lots, per lb. contained titanium $1.35
- Less ton lots $1.40

High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per carload $142.50

Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton $58.50

Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton $75.00

Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo. 95c.

Calcium molybdate, 40%-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo. ..... 80c.

Molybdenum oxide briquetes, 48%-52% Mo, f.o.b. Langeloth, Pa., per lb. contained Mo ..... 80c.

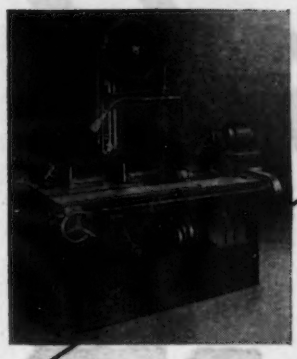
Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo ..... 80c.

Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales
- Carload lots ..... 14c.

Zirconium, 12-15%, contract basis, lump f.o.b. plant usual freight allowances, per lb. of alloy
- Carload, bulk ..... 4.6c.

Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk ..... 5.75c.
- Ton lots ..... 7.25c.

Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.
- Car lots ..... 8.75c.
- Ton lots ..... 9.25c.



No other saw can do as much!

No Other Saw Can Do As Much!
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Being the largest exclusive manufacturer of metal sawing machines and blades, both hack saw and band saw type, we have the correct answer to your cut-off problems. Each MARVEL model has a distinct application, so write us and we will send our catalog, price and recommendation for the saw to fill your requirements most efficiently. MARVEL sawing engineers are also available to discuss and analyze your cut-off work. (Without obligation of course)

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2 PLANTS
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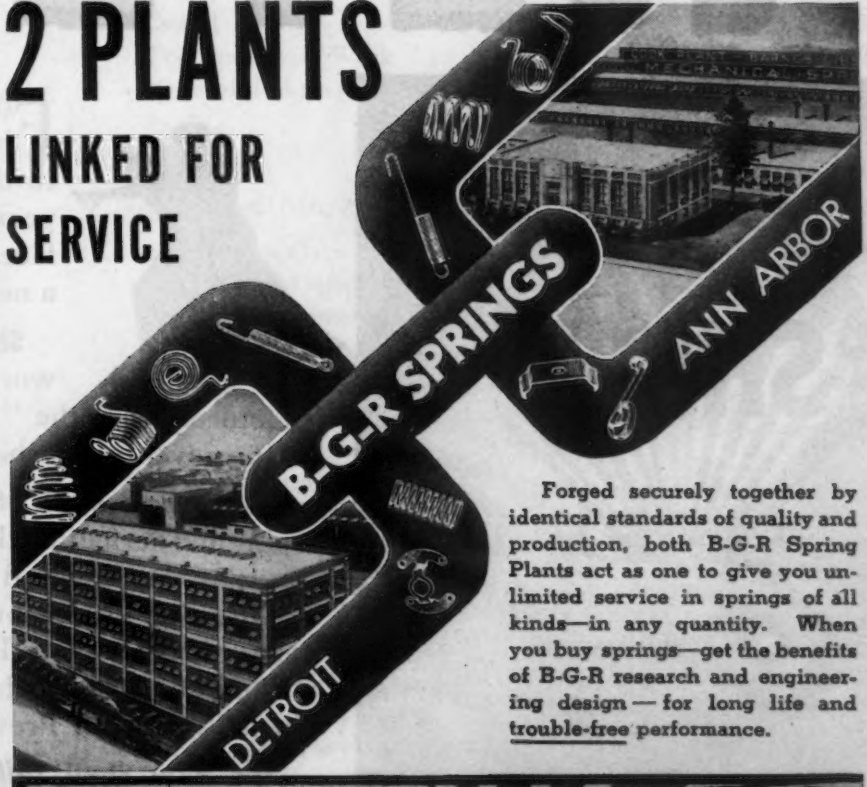

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The new Shell Tellus Oils are not designed to *remove* rust. They will not eliminate all existing rusting conditions that may be present in your machines. But where moisture is a factor, the new Shell Tellus Oils, because of the special rust-inhibiting qualities built into them, afford unequaled protection against the formation of rust ... and without the sacrifice of other valuable